

## Drug-related Problems and Contributing Factors among Hospitalized Patients in Gedo Hospital, Gedo Town, West Shoa Zone, Oromia, West Ethiopia

Abiru Neme Negewo\*

Jimma University College of Public Health and Medical Sciences, Department of Nursing and Midwifery, 378 Jimma, Ethiopia

### Abstract

**Background:** The increasing number of available drugs and drug users, as well as more complex drug regimen leads to more side effect and drug interaction and complicates follow-up. A drug related problem is any undesirable event experienced by the patients which involves, or is suspected to involve, drug therapy, and that interferes with achieving the desired goals of therapy.

**Objectives:** To assess drug related problems and contributing factors among hospitalized patients at Gedo Hospital, West Shoa zone, West Ethiopia.

**Methods:** Prospective cross sectional study was conducted among hospitalized patients at Gedo Hospital in Gedo town. The study population was hospitalized patients at internal medicine, paediatrics, surgical, gynaecology and obstetrics wards of Gedo Hospital from March 15 - May 11, 2018. Data on socio-demographic variables current diagnosis, current medication, length of hospital stay and average drugs per day were collected by using bed side interview guided semi-structured questionnaire and data abstraction formats for card review. The data were analysed by using SPSS version 20.0 for windows. Descriptive statistics, cross- tabs, and logistic regression were done.

**Result:** Out of 209 study participants, 151 (75.6%) had drug related problems. From the six classes of drug related problems studied, 75 (35.9%) of the drug related problems were non-compliance followed by need of additional drug therapy 63 (30.1%). Factors independently predicted the occurrence of drug related problems in the study area were sex, educational status, occupation, poly pharmacy and number of diagnosed diseases.

**Conclusion and Recommendation:** The prevalence of drug related problems was substantially high (75.6%). Furthermore, all classes of drug related problem were common.

For a better delivery of health service with regard to patient care and management patient oriented or clinical pharmacist should be assigned to Gedo Hospital.

**Keywords:** Drug; Drug therapy; Non-compliance; Gedo

### Introduction

Cross-sectional survey of 219 patients aged 75 years and over who were consecutive unplanned admissions to acute medical units of the Royal Hobart Hospital Seventy-three of 240 (30.4%) admissions may have been a result of ADE. Patients admitted because of ADE were taking more drugs than those admitted for other reasons. Most ADE were adverse drug reactions to a single (46%) or multiple drugs (25%). Non-compliance, omission or cessation of indicated treatment accounted collectively for 26% of admissions. Of all ADE admissions 53.4% were considered definitely preventable. The commonest causative drugs were cardiovascular drugs (48.4%), and the commonest manifestations were falls and postural hypotension (24.1%), heart failure (16.9%) and delirium (14.5%). ADE categories in which a high proportion of admissions were both severe and definitely preventable were non-compliance and omission of indicated treatment [1].

Drug related problems are also in community setting. A review 1000 clinical cases notes, developed during delivery of medication management review in Australia identified an overall 2222 medication related problems. 90% of patients had at least one medication related problems [2]. The observational, longitudinal study was done at the School Pharmacy of Newton Paiva University Center, Belo Horizonte, Brazil found out that the uncontrolled of patients 73.6% were drug related problem. DRPs identified were effectiveness related problems (53.2%), necessity related problems (25.2%), and safety related problems (21.6%) [3].

The DRPs most frequently recorded by a study in Norway were dose related problems (35.1% of the patient), non-optimal drugs (21.4%) and need for additional drugs (19.7%) [4]. The other problems were unnecessary drugs (16.7%), no further need (9.4%), interaction (8.8%), and adverse drug reaction (7.8%), and compliance problems (2.9%) [5].

Nation-wide sample of medication review conducted between 1998 and 2005 in Australia identified 1,038 drug-related problems from 234 medication review (mean 4.6 ( $\pm$  2.2) problems per review). The number of problems was higher (4.9  $\pm$  2.0 vs. 3.9  $\pm$  2.2) in review home dwelling patients compared with care-facility residents. The number of clinically-significant problems was higher (2.1  $\pm$  1.1 vs 1.5  $\pm$  0.7) for home- dwelling patient. The common types DRPs identified by nation- wide sample of medication review conducted in Australia

\*Corresponding author: Abiru Neme Negewo, Jimma University College of Public Health and Medical Sciences, Department of Nursing and Midwifery, 378 Jimma, Ethiopia, Tel: +251917634775; E-mail: [abiruneme@gmail.com](mailto:abiruneme@gmail.com)

Received October 16, 2018; Accepted November 18, 2018; Published December 10, 2018

**Citation:** Negewo AN (2018) Drug-related Problems and Contributing Factors among Hospitalized Patients in Gedo Hospital, Gedo Town, West Shoa Zone, Oromia, West Ethiopia. Clin Pharmacol Biopharm 7: 186. doi: [10.4172/2167-065X.1000186](https://doi.org/10.4172/2167-065X.1000186)

**Copyright:** © 2018 Negewo AN. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

were drug selection problems (24.9%), adverse drug reaction (19.7%), untreated indications (15.7%), and compliance problems (11.0%) and over or under dose prescribed (8.9%) [6]. Compliance problems were identified in home medicine reviews significantly more frequently than with residential medication management review. In this study it was identified different reasons for different classes of DRPs. Conditions not adequately treated and preventive therapy required were reasons mentioned for untreated indication. Duplication, drug interaction and wrong dosage form were reasons mentioned for drug selection problem. Dose too high, dose too low were reasons mentioned for inappropriate dose. Taking too little, taking too much and difficulty using dosage form were reasons mentioned for compliance related problems [7].

The finding of a study done in Jordan revealed from the total TRPs identified 30.6% were efficacy related problems. Among the efficacy related problems, efficacy dosage regimen issue (16.49%) and patient require additional therapy (7.15%) were more common. The other efficacy related problems identified were more effective drug is available or recommended (6.60%) and efficacy interaction issue (0.43%). From the total TRPs 24.94% were safety related problems. Among safety related problems safety dosage regimen issue (8.38%), safety interaction issue (7.37%) and allergic reaction or undesirable effect (3.99%) were common. The other safety related problems identified were the patient is high risk for developing adverse drug reaction and needs monitoring or prophylaxis (3.83%) and a drug contraindicate and safety medication is recommended (1.57%). Among the TRPs identified 16.44% were indication related problems which includes unnecessary drug therapy (5.93%) and untreated condition that require drug therapy (10.51%). Adherence related problems account 6.42% of the total TRPs [8].

The study from Minnesota shows that, need additional drug therapy (32%), dosage too low (23%), non-compliance (16%), adverse drug reaction (11%), dosage too high, unnecessary drug therapy, and ineffective drug therapy were (6%). From southern Australia shows that. Non-compliance (32%), need additional drug therapy (16%), ineffective drug therapy (15%), adverse drug reaction (12%), dosage too low (11%), unnecessary drug therapy and dosage too low were (7%) [9].

The common types of DRPs identified in study done in Spain among patients discharged from medical department were additional treatment (34.5%), inappropriate drug (18.4%), under dosage (15.0%), and unnecessary treatment (14.3%). The other types identified were over dosage (12.6%) and non-compliance (0.6%) [10].

A study done in Jordan identified different reasons for different types of TRPs. Drug use without indication, the patient treatment should be stepped down and duplication of therapy were reasons mentioned for unnecessary drug therapy. Untreated condition that need drug therapy and patients requires additional drug therapy were reasons mentioned for additional drug therapy need. More effective drug is available/recommended, low dose, correct dose but inappropriate frequency, short duration, and drug interaction were reasons mentioned for efficacy related problem. High dose, correct dose but inappropriate frequency and excessive duration were reasons mentioned for safety problems.

A study done in Jordan had identified drugs which mostly involved with DRPs. Proton pump inhibitors, beta blockers, H2-blockers, antibiotics, ACE-I and NSAIDs were involved with unnecessary drug therapy. ACE-I, aspirin, thiazide diuretics, beta-blockers and beta 2-agonist were drugs involved with additional drug therapy. Calcium channel blockers, H2-blockers, beta-blockers, loop diuretics, anti-platelets, sulfonyleurea and biguinide were involved ineffective drug therapy. Antibiotic, insulin, NSAIDs, anticoagulants, ACE-I, statin,

steroid, inhaled steroid and beta blockers were involved with low dosage. Antibiotic, beta-blockers, calcium channel blockers, anti-platelet, steroid, anticoagulant, beta2-agonst and proton pump inhibitor were involved high dosage [11].

A review clinical cases notes, developed during the medication management reviews in Australia identified drugs mostly involved with DPRs. Diuretics, beta-blockers, calcium channel blockers, ACE-I, analgesics, psychleptics and NSAIDs were implicated with wrong drug. Diuretics, Digoxin, ACE-I, paracetamol, psychleptics, inhaled corticosteroid, diabetic agent, and drugs for peptic ulcer, NSAIDs, and allopurinol were implicated with wrong dose. Ranitidine was implicated with unnecessary drug therapy. Laxative and aspirin were implicated with need additional drug therapy [12]. A prospective multicentre study of patients admitted to six internal medicine departments represented by cardiac, respiratory and geriatric wards at four hospital in Norway showed anti biotic users to have more DRPs (3.0 vs.2.2) than non-users [13].

A retrospective cross-sectional study performed in an acute care hospital in Singapore revealed that of the total 347 patient prescribed polypharmacy (43% female and 52.8% geriatrics), no statistical number of medication was associated with higher risk for patients with DRPs on admission ( $P=0.001$ ), but not for inpatient with DRPs ( $P=0.19$ ) [14].

## Methods and Participants

### Study area and period

This study was conducted at Gedo Hospital in Gedo town, which is located in West Ethiopia and 232 km away from Addis Ababa, from March 15-May 11, 2018.

### Study design

A prospective Cross sectional study was conducted in order to assess drug related problems and contributing factors among hospitalized patients in Gedo Hospital.

### Population

**Source population:** All hospitalized patients in medical, pediatrics, surgery, and gynecology wards at Gedo Hospital.

**Study population:** Hospitalized patients at internal medicine, surgery, Gynecology and Obstetrics and pediatric wards during the data collection period who fulfil the inclusion criteria were included at Gedo Hospital.

### Criteria

**Inclusion criteria:** Hospitalized Patients at internal medicine, surgery, Gynecology and Obstetrics and pediatric wards who were taking at least one medication for therapeutic or prophylactic purpose.

**Exclusion criteria:** Patients admitted to other wards or out patients. Patients who died during their hospital stay or those who underwent incomplete treatment (less than 24 h therapeutic dose) will also be excluded.

### Sample size determination and technique

**Sample size determination:** All patients who were found receiving medicine, surgery, Gynecology and Obstetrics and pediatric wards services in the study period were covered in the study.

**Sampling technique:** No sampling technique was employed since all of the study population who fulfil the inclusion criteria were covered.

## Study variable

**Dependent variable:** Drug related problems, which include the following six classes

- Dosage too high
- Dosage too low
- Ineffective drugs
- Need additional drug therapy
- Non compliance
- Unnecessary drug therapy

## Independent variable

- Socio-demographic variable (age, sex, marital status, educational level, occupation)
- Medication history (social drug use and counselling and advice on prescription)
- Current medication (average numbers of drugs per day)
- Type and number of diagnosed diseases
- Prescriber's educational level
- Ward type
- Length of stay in the hospital
- Choice of drug

## Data collection instrument

Pre-tested interview guided semi- structured questionnaire and data abstraction formats were used for data collection. The questionnaire had questions on socio-demographic variables, social drug use and medication compliance. The questionnaire was prepared in English. For identification of DRPs; Harrison's principle of internal medicine, 17<sup>th</sup> edition, Nelson text book paediatrics 18<sup>th</sup> edition, pharmacotherapy: A pathophysiology approach, 8<sup>th</sup> edition, up to date 19.3, WHO guideline for TB/HIV 2010 and standard treatment guideline for general hospitals, 2010 were used. The drug related problems evaluation tool was prepared based on their categories.

**Pre-test:** A pre-test study was performed on 5% of the patients as per to the inclusion criteria at the same study area to check the strength of data collection tool and to re-design data collection tool as well as data collection process. Income and reasons for drug use and discontinuation were not found to be answered appropriately by the study participants. Therefore, these variables were removed from the study.

**Data quality assurance:** The principal investigators were giving feedback on daily basis for the data collection before we deployed to the other wards. Completeness, accuracy, and clarity of the collected data were checked carefully. Any error, ambiguity, and incompleteness which were not observed at supervision were addressed on the following day before starting the next day activities.

## Data collection processing and analysis

The data collected was sorted; categorized and analyzed using SPSS version 20.0 and the results were interpreted and presented using tables and graphs. The data collection format was pretested before actual data collection and data checking was done every day and format with

insufficient information were excluded.

## Ethical consideration

A formal letter was written from Jimma University student research program (SRP) to Gedo Hospital to get permission for data collection. An official approval was obtained from the responsible authorities after explaining the aim of the study. Patients' name was not written on the data collection tool for keeping the confidentiality of the information obtained. Patients' written informed consent was obtained before beginning data collection.

### Operational definitions

**Dosage:** Includes the dose given, frequency of administration and the duration of therapy.

**Dosage too high:** If the dosing frequency is too short or if the duration of drug therapy is too long or if a drug interaction occurs resulting in a toxic reaction to the drug product or if the dose of the drug was administered too rapidly.

**Dosage too low:** The dose is too low to produce the desired response or if the dosage interval is too infrequent to produce the desired response or if a drug interaction reduces the amount of active drug available or if the duration of drug therapy is too short to produce the desired response.

**Ineffective drug use:** If the drug is not the most effective for the medical problem or if the medical condition is refractory to the drug product or if the dosage form of the drug product is inappropriate or if the drug product is not an effective product for the indication being treated.

**Need for additional drug therapy:** If a medical condition requires the initiation of drug therapy or if preventive therapy is required to reduce the risk of developing a new condition or if a medical condition requires additional pharmacotherapy to attain synergistic or additive effects but not initiated.

**Non-compliance:** If the patient does not understand the instructions for drugs taking or if the patient prefers not to take the medication or if the patient forgets to take the medication or if the drug product is too expensive for the patient or if the patient cannot swallow or self-administer the drug product appropriately or if the drug product is not available for the patient.

**Polypharmacy:** Concomitant use of five or more drugs per day.

**Unnecessary drug therapy:** If there is no valid medical indication or if multiple drugs are being used for a condition that requires single drug therapy or if the medical condition is more appropriately treated with non-drug therapy or if the drug being taken to treat medical condition is associated with another an unavoidable adverse reaction.

## Results

### Socio-demographic characteristics

Among the study participants majority of them were male 129(61.7%) (Table 1).

Socio-demographic characteristics of hospitalized patients in Gedo hospital, Gedo town, from March 15-May 11, 2018.

### Drug-related problems

Among patients involved in the current study 151(75.6%) had drug-related problems were 58(24.4%) does not have.

Socio demographic variables		Frequency	Percent (%)
Sex	Male	129	61.7
	Female	80	38.3
Age	0-5	54	25.8
	6-14	8	3.8
	15-24	19	9.1
	25-34	51	24.4
	35-44	31	14.8
	45-54	24	11.5
	55-64	14	6.7
	>/=65	8	3.8
Educational status	Illiterate	114	54.5
	1-4 class	16	7.7
	5-8 class	26	12.4
	9-10 class	27	12.9
	11-12 class	18	8.6
	College	8	3.8
Marital status	Single	45	21.5
	Married	140	67.0
	Divorced	7	3.3
	Widowed	17	8.1
Occupation	Farmer	39	18.7
	Merchant	37	17.7
	Employed	30	14.4
	non employed	17	8.1
	house wife	54	25.8
	Student	22	10.5
	Other	10	4.8

**Table 1:** Socio-demographic characteristics of hospitalized patients in Gedo hospital, Gedo town, from March 15-May 11, 2018.

A total of 259 drug-related problems were identified. Seventy five (35.9%) of the DRPs were non-compliance followed by needing additional drug therapy 63(30.1%) (Table 2).

Among study participants 22(10.5%) of patients were needed antibiotic to be added on their therapeutic regimen (Table 3).

### Predictors of having drug related problems

From these study 97(46.7%) male and 61(29.2%) female had drug related problem. Among 158 patients who had drug related problem 103(49.3%) were married. There statistically significant between drug related problem and occupation (student), number of diagnosed disease and surgical ward with P-value of 0.027, 0.007 and 0.018 (Table 4).

Among 63 patients who need additional drug therapy 33(15.8%) were female and 30(14.4%) 02 were male. There were a statically significant association between needing additional drug therapy and educational status of 1-4 class and that of average numbers of drugs per day with P-value of 0.04 and 0.036 respectively (Table 5).

There were statistically significant association between unnecessary drug therapy and sex of the patient, illiterate, 1-5 class, average numbers of drugs per day, internal medicine, surgery and gynaecology with p-value of 0.044, 0.025, 0.013, 0.000, 0.005, 0.003 and 0.046 (Table 6).

Among 39 patients who have ineffective drug therapy 22(10.5%) were male, 21 (10.0%) were 0-5 age, 19 (9.1%) were illiterate, 30 (14.4%) were married, 24(11.5%) two or more diagnosed disease, average numbers of drugs >5 were 27 (12.9%) and 22 (10.5%) were in pediatric ward. Educational status (5-8) was statistically significant to ineffective drug therapy P-value 0.03 (Table 7).

Among 21 patients who have high dosage were 15 (7.2%) male,

Types of drug therapy problem	Frequency	Percent (%)
Non-compliance	75	35.9
Needing additional drug therapy	63	30.1
Unnecessary drug therapy	45	21.5
Ineffective drug therapy	39	18.7
High dosage	21	10.0
Low dosage	16	6.7

**Table 2:** Types of drug related problems in hospitalized patients in Gedo hospital, Gedo town, from March 15-May 11, 2018.

11 (5.3%) were illiterate, 17 (8.1%) were married, were 16 (7.7%) were internal medicine and polypharmacy. There was statistically significant association between surgical ward and high dosage (Table 8).

Among 16 patients who have low dosage 12 (5.7%) were male, 5 (2.4%) were 25-34 age, 11 (5.3%) were illiterate, 9 (4.3%) were married, 24 (11.5%), average numbers of drugs >5 were 13 (6.2%) and 14 (6.7%) were in medical ward (Table 9).

Among 75 patients who were no-compliance 52(24.9%) were male, 20(9.6%) were 0-5 age, 39 (18.7%) were illiterate, 51 (24.4%) were married, 24 (11.5%), average numbers of drugs >5 were 55 (26.3%) and 41 (19.6%) were in medical ward (Table 10).

There statistically significant association between non-compliance and sex, educational status (1-4), marital status (single and married), occupation (farmer and house wife), number of diagnosed disease and surgical ward with P-value of 0.004, 0.037, 0.038, 0.035, 0.005,0.002, 0.036 and 0.03 (Table 11).

### Discussion

The presence of drug related problems among hospitalized patients is associated with different with different reasons and risk factors. Identifying these factors is crucial for prevention and control of DRPs in an individual patient. Small numbers of studies from developed and middle income countries had different classes of drug related problems (DRPs), the drugs involved with the respective class, the reason and risk factors associated with DRPs.

The current study showed that 75.6% of patients admitted in Gedo Hospital with in the study period had DRPs which was lower than what was found in Norway (81%) [15] and the internal medicine ward of one of the largest hospital in Jordan (98.3%) [16]. The difference might be due to the exclusion of adverse drug reaction by the current study and dependency of DRP identification on national drug list may be expected to be lower in number and variety for Ethiopia than Jordan and Norway. The inclusion criteria of the study from Jordan which only include high risk groups might also widen the gap from the present study.

This study shows that different types of DRPs which include non-compliance (35.9%), needing of additional drug therapy (30.1%) and unnecessary drug therapy (21.5%) were the leading drug related problems identified.

Compliance related problem (35.9%) which includes non-compliance were the leading DRP identified. Indication related problem (51.6%) which includes need additional drug therapy (30.1%) and unnecessary drug therapy (21.5%) were the second leading DRPs identified. Effectiveness related problem (25.4%) which includes ineffective drug therapy (18.7%) and low dosage (6.7%) were the third prevalent groups of DRPs. Safety related problems include adverse drug reaction and high dosage. But because of limitation of the current study it was assigned only for high dosage. Safety related problems

Drug class or drug name	Needing additional drug therapy No_ (%)	Unnecessary drug therapy No_ (%)	Ineffective drug therapy No_ (%)	High dosage No_ (%)	Low dosage No_ (%)	Non-compliance No_ (%)
Antibiotic	22 (10.5)	12 (5.7)	24 (11.5)	4 (1.9)	5 (2.4)	23 (11.0)
Antifungal	5 (2.4)	-	1 (0.5)	-	-	-
Antiviral	3 (1.4)	-	-	-	-	8 (3.8)
Anti-pain	5 (2.4)	1 (0.5)	-	1 (0.5)	1 (0.5)	-
ACE inhibitor	1 (0.5)	1 (0.5)	-	-	-	9 (4.3)
Diuretics	2 (1.0)	5 (2.4)	-	4 (1.9)	4 (1.9)	4 (1.9)
Beta blocker	2 (1.0)	4 (1.9)	4 (1.9)	-	-	-
Corticosteroid	4 (1.9)	1(0.5)	-	6 (2.9)	-	2 (1.0)
FeSO <sub>4</sub> or/and folic acid	9 (4.3)	-	-	-	-	-
Digoxin	9 (4.3)	-	-	4 (1.9)	-	23 (11.0)
Acid secretion inhibitors	4 (1.9)	16 (7.7)	-	1 (0.5)	-	-
Anticonvulsants	1 (0.5)	2 (1.0)	4 (1.9)	1 (0.5)	-	-
Anti-malaria	1 (1.5)	-	-	-	-	-
Spirinolactone	2 (1.0)	-	5 (2.4)	-	6 (2.9)	4 (1.9)
Salbutamol	1 (0.5)	2 (1.0)	-	-	-	-
Pyridoxine	6 (2.9)	-	-	-	-	-
Aminophylline	-	2 (1.0)	-	-	-	-
Anticoagulant	1 (0.5)	-	-	-	-	-
KCl	1 (0.5)	1 (0.5)	-	-	-	-
Therapeutic feeding	4 (1.9)	-	-	-	-	-

**Table 3:** Drugs involved with individual drug related problems among hospitalized patients in Gedo hospital, Gedo town, from March 15-May 11, 2018.

Drug related problem	Drug related problem		COR (95%CI)	p-value	
	Yes	No			
Sex	Male	97 (46.4%)	32 (15.3%)	1	0.775
	Female	61 (29.2%)	19 (9.1)	1.197 (0.347,4.125)	
Age	0-5	43 (20.6%)	11 (5.3%)	1	0.775
	6-14	7 (3.3%)	1 (.5%)	0.155 (0.006,3.706)	0.249
	15-24	13 (6.2%)	6 (2.9%)	1.277 (0.179, 9.099)	1.000
	25-34	42 (20.1%)	9 (4.3%)	0.813 (0.230, 2.873)	1.000
	35-44	21 (10.0%)	10 (4.8%)	1.593 (0.481, 5.278)	1.000
	45-54	15 (7.2%)	9 (4.3%)	2.278 (0.628, 8.268)	1.000
	55-64	10 (4.8%)	4 (1.9%)	2.119 (0.383, 11.726)	1.000
	>=65	7 (3.3%)	1 (.5%)	0.734 (0.022, 24.262)	1.000
Educational status	Illiterate	41.6%	12.9%	1	0.264
	1-4 class	12 (5.7%)	4 (1.9%)	1.603 (0.314, 8.189)	0.570
	5-8 class	24 (11.5%)	2 (1.0%)	0.235 (0.036, 1.541)	0.131
	9-10 class	16 (7.7%)	11 (12.9%)	1.700 (0.344, 8.411)	0.516
	11-12 class	14 (6.7%)	4 (1.9%)	0.568 (0.070, 4.620)	0.597
	College and above	5 (2.4%)	3 (1.4%)	2.609 (0.210, 32.36)	0.455
Marital status	Married	103 (49.3%)	37 (17.7%)	1	0.454
	Single	36 (17.2%)	9 (4.3%)	3.868 (0.664, 22.54)	0.132
	Widowed	13 (6.2%)	4 (1.9%)	1.806 (0.065, 50.)	0.727
	Divorced	6 (2.9%)	1 (.5%)	6.601 (0.454, 96.04)	0.167
Occupation	Farmer	29 (13.9%)	10 (4.8%)	1	0.244
	Merchant	33 (15.8%)	4 (1.9%)	0.886 (0.155, 5.06)	0.892
	Employed	20 (9.6%)	10 (4.8%)	2.147 (0.278, 16.572)	0.464
	Non employed	14 (6.7%)	3 (1.4%)	0.715 (0.092, 5.536)	0.748
	House wife	39 (18.7%)	15 (7.2%)	2.185 (0.415, 11.50)	0.356
	Student	15 (7.2%)	7 (3.3%)	19.013 (1.389, 260.3)*	0.027*
Smoking	Yes	41 (19.6%)	17 (8.1%)	1	0.693
	No	117 (56.0%)	34 (16.3%)	1.355 (0.300, 6.115)	
Alcohol	Yes	3 (1.4%)	1 (0.5%)	1	0.666
	No	155 (74.2%)	50 (23.9%)	0.503 (0.022, 11.405)	
Khat	Yes	60 (28.7%)	23 (11.0%)	1	0.219
	No	98 (46.9%)	28 (13.4%)	0.350 (0.065, 1.868)	

Number of diagnosed diseases	One	78 (37.3%)	41 (19.6%)	1	0.007*
	Two or more	80 (38.3%)	10 (4.8%)	0.258 (0.096, 0.696)*	
Average number of drugs per day	Less than five	54 (25.8%)	28 (13.4%)	1	0.417
	Greater than five	104 (49.8%)	23 (11.0%)	0.698 (0.293, 1.663)	
Length of hospital stay	≤ 7	78 (37.3%)	29 (13.9%)	1	0.515
	>7	80 (38.3%)	22 (10.5%)	0.761 (0.333, 1.735)	
Ward type	Internal	79 (37.8%)	15 (7.2%)	1	0.118
	Pediatrics	49 (23.4%)	12 (5.7%)	2.520E8 (0.000)	1.000
	Surgery	23 (11.0%)	18 (8.6%)	3.872 (1.256, 11.935)*	0.018*
	Gynecology	7 (3.3%)	6 (2.9%)	2.270 (0.411, 12.53)	0.347
Current diagnosis of the patients	Cardiovascular problem	3 (1.4%)	0 (0.0%)		
	CLD	9 (4.3%)	0 (0.0%)		
	DM	8 (3.8%)	0 (0.0%)		
	HPN	1 (0.5%)	1 (0.5%)		
	GI problem	3 (1.4%)	2 (1.0%)		
	Anemia	4 (1.9%)	0 (0.0%)		
	Seizure	5 (2.4%)	0 (0.0%)		
	RVI	5 (2.4%)	0 (0.0%)		
	Infectious	38 (18.2%)	15 (7.2%)		
	Cardiac + any additional diagnosis	12 (5.7%)	1 (0.5%)		
	Infectious + any non-cardiac diagnosis	37 (17.7%)	7 (3.3%)		
	DHN	4 (1.9%)	1 (0.5%)		
	Trauma	13 (6.2%)	11 (5.3%)		
	Gangrene	1 (0.5%)	1 (0.5%)		
	Hydrocell	0 (0.0%)	3 (1.4%)		
	Abscess	2 (1.0%)	1 (0.5%)		
	Appendicitis	0 (0.0%)	3 (1.4%)		
	UVP	0 (0.0%)	2 (1.0%)		
	PID	0 (0.0%)	2 (1.0%)		
	hyper emesis gravidum	3 (1.4%)	1 (0.5%)		
	Abortion	2 (1.0%)	0 (0.0%)		
	Hepatic	2 (1.0%)	0 (0.0%)		
	Fistula	2 (1.0%)	0 (0.0%)		
DVT	1 (0.5%)	0 (0.0%)			
AGN	1 (0.5%)	0 (0.0%)			
CA	2 (1.0%)	0 (0.0%)			

Others; tureta COR crude odds ratio CI confidence interval \* statistically significant

COR-crude odds ratio, CI-confidence interval, \*statistically significant

**Table 4:** Effect of socio-demographic characteristics, social drug use and hospital predictors having drug related problem among hospitalized patients in Gedo hospital, Gedo town, from March 15-May 11, 2018.

	Needing additional drug therapy		COR(95%CI)	p-value
	Yes	No		
Sex	Male	30 (14.4%)	99 (47.4%)	0.614 (0.244, 1.544)
	Female	33 (15.8%)	47 (22.5%)	
Age	0-5	14 (6.7%)	40 (19.1%)	0.714
	6-14	5 (2.4%)	3 (1.4%)	0.088 (0.007, 1.126)
	15-24	6 (2.9%)	13 (6.2%)	1.000
	25-34	16 (7.7%)	35 (16.7%)	1.000
	35-44	7 (3.3%)	24 (11.5%)	1.000
	45-54	7 (3.3%)	17 (8.1%)	1.000
	55-64	5 (2.4%)	9 (4.3%)	1.000
	≥65	3 (1.4%)	5 (2.4%)	1.000
Educational status	Illiterate	36 (17.2%)	78 (37.3%)	1
	1-4 class	3 (1.4%)	13 (6.2%)	5.904 (1.088, 32.029)*
	5-8 class	9 (4.3%)	17 (8.1%)	1.404 (0.415, 4.747)
	9-10 class	5 (2.4%)	22 (10.5%)	2.103 (0.453, 9.773)
	11-12 class	8 (3.8%)	10 (4.8%)	0.618 (0.105, 3.643)
	College and above	2 (1.0%)	6 (2.9%)	1.908 (0.179, 20.35)

Marital status	Single	15 (7.2%)	30 (14.4%)		0.334
	Married	36 (17.2%)	104 (49.8%)	0.859 (0.209, 3.536)	0.834
	Divorced	8 (3.8%)	9 (4.3%)	0.191 (0.021, 1.752)	0.143
Number of diagnosed disease	One	32 (15.3%)	87 (41.6%)	1	0.331
	Two or more	31 (14.8%)	59 (28.2%)	0.672 (0.301, 1.499)	
Average numbers of drugs /day	≤ 5	31 (14.8%)	51 (24.4%)	2.294 (1.055,4.989)*	0.036*
	>5	32 (15.3%)	95 (45.5%)	1	
Length of hospital stay	≤ 7 days	36 (14.8%)	71 (36.4%)	1	0.769
	>7 days	32 (15.3%)	70 (33.5%)	0.898 (0.437, 1.843)	
Ward type	Internal medicine	32 (15.3%)	62 (29.7%)		0.525
	Paediatrics	19 (9.1%)	42 (20.1%)	0.000	1.000
	Surgery	9 (4.3%)	32 (15.3%)	1.401 (0.491, 3.999)	0.529
	Gynaecology	3 (1.4%)	10 (4.8%)	3.620 (0.625, 20.953)	0.151

COR-crude odds ratio, CI-confidence interval, \*statistically significant

**Table 5:** Predictors of additional drug therapy need among hospitalized patients Gedo hospital, Gedo town, from March 15-May 11, 2018

	Unnecessary drug therapy		COR (95%CI)	p-value	
	Yes	No			
Sex	Male	29 (13.9%)	100(47.8%)	1	0.044*
	Female	16 (7.7%)	64(30.6%)	5.277 (1.043, 26.696)	
Age	0-5	5 (2.4%)	49(23.4%)		0.486
	6-14	1 (.5%)	7(3.3%)	0.210 (0.007, 6.163)	0.366
	15-24	4 (1.9%)	15(7.2%)		1.000
	25-34	18 (8.6%)	33(15.8%)		1.000
	35-44	7 (3.3%)	24(11.5%)		1.000
	55-64	3 (1.4%)	11(5.3%)		1.000
	>=65	2 (1.0%)	6(2.9%)		1.000
Educational status	Illiterate	20 (9.6%)	94(45.0%)	1	0.025*
	1-4 class	7 (3.3%)	9(4.3%)	0.101 (0.017, 0.613)	0.013*
	5-8 class	6 (2.9%)	20(9.6%)	0.624 (0.121, 3.201)	0.571
	9-10 class	6 (2.9%)	21(10.0%)	4.969 (0.778, 31.733)	0.090
	11-12 class	4 (1.9%)	14 (6.7%)	10.073 (0.978, 103.745)	0.052
College and above	2 (1.0%)	6 (2.9%)	2.632 (0.191, 36.248)	0.470	
Marital status	Single	8 (3.8%)	37 (17.7%)	1	0.484
	Married	32 (15.3%)	108 (51.7%)	0.444 (0.094, 2.091)	0.305
	Divorced	5 (2.4%)	12 (5.7%)	1	0.999
	Widowed	0 (.0%)	7 (3.3%)	0.114 (0.007, 1.751)	0.119
Number of diagnosed disease	One	22 (10.5%)	97 (46.4%)	1	0.362
	Two or more	23 (11.0%)	67 (32.1%)	1.614 (0.577, 4.516)	
Average number drugs per day	≤ 5	6 (2.9%)	76 (36.4%)	1	0.000*
	>5	39 (18.7%)	88 (42.1%)	0.059 (0.015, 0.241)	
Length of hospital stay	≤ 7 days	21 (10.0%)	86 (41.1%)	1	0.262
	>7 days	241 (1.5%)	78 (37.3%)	0.592 (0.236, 1.481)	
Ward type	Internal medicine	32 (15.3%)	62 (29.7%)	1	0.005*
	Paediatrics	5 (2.4%)	56 (26.8%)	1.707E10 (0.000)	1.000
	Surgery	4 (1.9%)	37 (17.7%)	10.509 (2.223, 49.677)	0.003*
	Gynaecology	4 (1.9%)	9 (4.3%)	0.122 (0.015,0 .966)	0.046*

COR-crude odds ratio, CI-confidence interval, \*statistically significant

**Table 6:** Predictors of unnecessary drug therapy among hospitalized patients in Gedo hospital, Gedo town, from March 15-May 11, 2018.

(high dosage) account (10.0%) of the identified problem. A study from southern Australia in ambulatory patients [17], the common DRPs were non-compliance (32%), need additional drug therapy (16%), ineffective drug therapy (15%), adverse drug reaction (12%), dosage too low (11%), unnecessary drug therapy and dosage too high (7%) which have similarity in non-compliance and need additional drug therapy as leading DRPs identified from this study. From study done in Spain at discharge [18], indication related problem (need additional drug therapy (34.5%) and unnecessary drug therapy (14.3%)) followed

by effectiveness related problem (inappropriate drug (18.4%) under dosage (15.0%)) were found to be the leading type of DRPs this study mostly similar to that of our study result, with the only difference is non-compliance is the leading DRP in our study, might be due to different area and most of the drugs were prescribed by the nurses. A study from Jordan [19], the common DRPs were efficacy related problems (30.66%), safety related problems (24.97%), indication related problems (16.4%) and patient related problems (15.27%) in decreasing order of prevalence which was different our study result. This difference

might be due to the difference in study population where high risk populations like patients suffering from higher number of medical conditions, receiving higher number of medication, patients with acute condition requiring frequent monitoring were studied in Jordanian study. From study done in Brazil [11], effectiveness (53.2%), necessity (25.2%) and safety (21.6%) with decreasing order of prevalence, although the study population used and the study design were quite different from the present study. Non-compliance was found to be the leading DRP identified (35.9%) in admitted patients in Gedo hospital which different with the other studies done elsewhere which were the least frequent in the study from [5,11,15]. This difference is due to poor communication between the patient and nurse, also due to the patient's perception, knowledge about the drugs. Target population was different which our study includes all hospitalized patients. Many of the patients prescription was prescribed by nurse.

Among study participants 30.1% had need additional drug therapy. Need additional drug therapy was mostly due to a medical condition that requires initiation of drug therapy (47.6%) the other reasons identified were preventive drug therapy required to reduce risk of developing a new condition or progression of the existing condition (36.5%) and to attain synergistic effect or additive effect (15.9%). Untreated indication and patient requires additional/combinational therapy were to be leading reason for need additional drug from studies done in Jordan [15] and Spain [11].

In the current study 21.5% of hospitalized patients had unnecessary drug therapy. Invalid indication for the drug therapy (68.9%), multiple drug products are used for a condition that need single drug therapy (26.7%) and the medical condition is appropriately treated with non-drug therapy (4.4%) were reasons for unnecessary drug therapy. This finding was similar to a study from Jordan [15]. Treatment duplicity was found to be a reason for unnecessary drug therapy by study done in Spain [11].

Ineffective drug therapy was identified in 18.7% of study participants. Ineffective drug therapy was mostly due to the drug was not the most effective for the medical condition (82.1%), the dosage product was inappropriate (5.1%) and the medical condition was refractory to a drug (12.8%). Similar studies from Jordan [15] and Australia [14].

In the present study 16.7% of hospitalized patients had inappropriate dosage (6.7% low dosage and 10.0% high dosage). Low dosage was mostly due to the reasons the dose given was low (87.5%) and potential drug interaction which might decrease the concentration of drug (12.5%). Similar study done in Australia [14], low dose was the reason for under dosage.

High dosage drug therapy was due to the reasons of the dose given was too high (57.1%) and there was drug interaction which increase

		Ineffective drug therapy		COR (95%CI)	p-value
		Yes	No		
Sex	Male	22 (10.5%)	107 (51.2%)	1	0.111
	Female	17 (8.1%)	63 (30.1%)	0.417 (0.142, 1.223)	
Age	0-5	21 (10.0%)	33 (15.8%)	19.410 (0.574, 656.21)	0.754
	6-14	2 (1.0%)	6 (2.9%)		0.099
	15-24	0 (0.0%)	19 (9.1%)		0.999
	25-34	8 (3.8%)	43 (20.6%)		1.000
	35-44	2 (1.0%)	29 (13.9%)		1.000
	45-54	2 (1.0%)	22 (10.5%)		1.000
	55-64	2 (1.0%)	12 (5.7%)		1.000
	>=65	2 (1.0%)	6 (2.9%)		1.000
Educational status	Illiterate	19 (9.1%)	95 (45.5%)	1	0.127
	1-4 class	2 (1.0%)	14 (6.7%)	1.490 (0.198, 11.217)	0.699
	5-8 class	10 (4.8%)	16 (7.7%)	0.214 (0.053, 0.858)	0.030*
	9-10 class	5 (2.4%)	22 (10.5%)	0.269 (0.046, 1.570)	0.145
	11-12 class	1 (0.5%)	17 (8.1%)	2.169 (0.120, 39.276)	0.600
	College and above	2 (1.0%)	6 (2.9%)	0.683 (0.044, 10.575)	0.785
Marital status	Single	7 (3.3%)	38 (18.2%)	1	0.362
	Married	30 (14.4%)	110 (52.6%)	2.162 (0.400, 11.678)	0.370
	Divorced	0 (0.0%)	7 (3.3%)	000	0.074
	Widowed	2 (1.0%)	15 (7.2%)	16.455 (0.763, 354.8)	0.999
Number of diagnosed disease	One	15 (7.2%)	104 (49.8%)	1	0.270
	Two or more	24 (11.5%)	66 (31.6%)	0.588 (0.229, 1.510)	
Average number of drugs per day	≤ 2	12 (5.7%)	70 (33.5%)	1	0.961
	>2	27 (12.9%)	100 (47.8%)	0.975 (0.346, 2.745)	
Length of hospital stay	≤ 7 days	22 (10.5%)	85 (40.7%)	1	0.580
	>7 days	17 (8.1%)	85 (40.7%)	1.292 (0.522, 3.197)	
Ward type	Internal medicine	15 (7.2%)	79 (37.8%)	1	0.528
	Paediatrics	22 (10.5%)	39 (18.7%)	4.384E9 (0.000)	1.000
	Surgery	2 (1.0%)	39 (18.7%)	4.181 (0.636, 27.479)	
	Gynaecology	0 (0.0%)	13 (6.2%)		

COR-crude odds ratio, CI-confidence interval, \*statistically significant.

Table 7: Predictors of ineffective drug therapy among hospitalized patients Gedo hospital, Gedo town, from March 15-May 11, 2018 .



		High dosage		COR (95% CI)	p-value
		Yes	No		
Sex	Male	15 (7.2%)	114 (54.5%)	1	0.424
	Female	6 (2.9%)	74 (35.4%)	2.087 (0.344, 12.643)	
Age	0-5	4 (1.9%)	50 (23.9%)		0.572
	6-14	0 (0.0%)	8 (3.8%)		0.999
	15-24	1 (0.5%)	18 (8.6%)		1.000
	25-34	6 (2.9%)	45 (21.5%)		1.000
	35-44	2 (1.0%)	29 (13.9%)		1.000
	45-54	6 (2.9%)	18 (8.6%)		1.000
	55-64	2 (1.0%)	12 (5.7%)		1.000
	>=65	0 (0.0%)	8 (3.8%)		1.000
Educational status	Illiterate	11 (5.3%)	103 (49%)	1	0.991
	1-4 class	2 (1.0%)	14 (6.7%)	0.701 (0.083, 5.913)	0.744
	5-8 class	1 (0.5%)	25 (12%)	1.110 (0.097, 12.649)	0.933
	9-10 class	3 (1.4%)	2411	0.605 (0.081, 4.529)	0.624
	11-12 class	4 (1.9%)	14 (6.7%)	0.462 (0.040, 5.391)	0.538
	College and above	0 (0%)	8 (3.8%)	1.073E8 (0.000)	0.999
Marital status	Single	2 (1.0%)	43 (20.6%)	1	0.854
	Married	17 (8.1%)	123 (58.9%)	0.440 (0.031, 6.174)	0.542
	Divorced	1 (0.5%)	6 (2.9%)	0.195 (0.005, 7.425)	0.378
	Widowed	1 (0.5%)	16 (7.7%)	5.079E7 (0.000)	0.998
Number of diagnosed disease	One	9 (4.3%)	110 (52.6%)	1	0.870
	Two or more	12 (5.7%)	78 (37.3%)	(0.286, 2.882)	
Average number of drugs per day	≤ 5	5 (2.4%)	77 (36.8%)	1	0.709
	>5	16 (7.7%)	111 (53.1%)	0.767 (0.191, 3.083)	
Length of hospital stay	≤ 7 days	10 (4.8%)	97 (46.4%)	1	0.816
	>7 days	11 (5.3%)	91 (43.5%)	1.152 (0.350, 3.786)	
Ward type	Internal medicine	16 (7.7%)	78 (37.3%)	1	0.245
	Paediatrics	4 (1.9%)	57 (27.3%)	0.000 (0.000)	1.000
	Surgery	1 (0.5%)	40 (19.1%)	12.200 (1.102, 135.051)*	0.041*
	Gynaecology	0 (0.0%)	13 (6.2%)	2.006E8 (0.000)	0.998

COR-crude odds ratio, CI-confidence interval, \*statistically significant

**Table 8:** predictors of high dosage among hospitalized patients in Gedo hospital, Gedo town, from March 15-May 11, 2018.

		Low dosage		COR (95% CI)	p-value
		Yes	No		
Sex	Male	12 (5.7%)	117 (56.0%)	1	0.993
	Female	4 (1.9%)	76 (36.4%)	(0.000)	
Age	0-5	0 (0.0%)	54 (25.8%)		0.866
	6-14	1 (0.5%)	7 (3.3%)		0.997
	15-24	1 (0.5%)	18 (8.6%)		0.999
	25-34	5 (2.4%)	46 (22.0%)		0.999
	35-44	5 (2.4%)	26 (12.4%)		0.999
	45-54	1 (0.5%)	23 (11.0%)		0.999
	55-64	3 (1.4%)	11 (5.3%)		0.999
	>=65	0 (0.0%)	8 (3.8%)		1.000
Educational status	Illiterate	11 (5.3%)	103 (49.3%)		0.986
	1-4 class	1 (0.5%)	15 (7.2%)		0.995
	5-8 class	1 (0.5%)	25 (12.0%)	0.697 (0.030, 16.092),	0.822
	9-10 class	1 (0.5%)	26 (12.4%)	1.606 (0.093, 27.854)	0.745
	11-12 class	2 (1.0%)	16 (7.7%)	0.453 (0.020, 10.318)	0.620
	College and above	0 (0.0%)	8 (3.8%)		0.998
Marital status	Single	5 (2.4%)	40 (19.1%)	1	0.833
	Married	9 (4.3%)	131 (62.7%)	2.122 (0.175, 25.688)	0.554
	Divorced	1 (0.5%)	6 (2.9%)	0.248 (0.001, 76.689)	0.634
	Widowed	1 (0.5%)	16 (7.7%)	0.018 (0.000)	10.000

Number of diagnosed disease	One	8 (3.8%)	111 (53.1%)		0.952
	Two or more	8 (3.8%)	82 (39.2%)	0.952 (0.196, 4.632)	
Average number of drugs per day	≤ 5	3 (1.4%)	79 (37.8%)		0.067
	>5	13 (6.2%)	114 (54.5%)	0.167 (0.025, 1.136)	
Length of hospital stay	≤ 7 days	9 (4.3%)	98 (46.9%)	1	0.110
	>7 days	7 (3.3%)	95 (45.5%)	3.415 (0.757, 15.413)	
Ward type	Internal medicine	14 (6.7%)	80 (38.3%)	1	0.514
	Paediatrics	1 (0.5%)	60 (28.7%)	0.145 (0.000)	
	Surgery	1 (0.5%)	40 (19.1%)	7.888 (0.544, 114.417)	
	Gynaecology	0 (0.0%)	13 (6.2%)		

COR-crude odds ratio, CI-confidence interval, \*statistically significant

**Table 9:** predictors of low dosage among hospitalized patients Gedo hospital, Gedo town, from March 15-May 11, 2018.

Variables	Non-compliance		COR (95%CI)	p-value	
	Yes	No			
Sex	Male	52 (24.9%)	77 (36.8%)	1	0.004*
	Female	23 (11.0%)	57 (27.3%)	0.216 (0.077, 0.605)	
Age	0-5	20 (9.6%)	34 (16.3%)	1	0.359
	6-14	2 (1.0%)	6 (2.9%)	3.395 (0.199, 58)	0.399
	15-24	4 (1.9%)	15 (7.2%)		1.000
	25-34	17 (8.1%)	34 (16.3%)		1.000
	35-44	15 (7.2%)	16 (7.7%)		1.000
	45-54	10 (4.8%)	14 (6.7%)		1.000
	55-64	5 (2.4%)	9 (4.3%)		1.000
>=65	2 (1.0%)	6 (2.9%)		1.000	
Educational status	Illiterate	39 (18.7%)	75 (35.9%)	1	0.299
	1-4 class	9 (4.3%)	7 (3.3%)	4.784 (1.096, 20.884)*	0.037*
	5-8 class	10 (4.8%)	16 (7.7%)	2.254 (0.664, 7.654)	0.192
	9-10 class	7 (3.3%)	20 (9.6%)	0.768 (0.186, 3.163)	0.715
	11-12 class	7 (3.3%)	11 (5.3%)	1.557 (0.271, 8.930)	0.619
	College and above	3 (1.4%)	5 (2.4%)	1.354 (0.125, 14.678)	0.803
Marital status	Single	13 (6.2%)	32 (15.3%)		0.038*
	Married	51 (24.4%)	89 (42.6%)	0.242 (0.065, 0.906)*	0.035*
	Divorced	4 (1.9%)	3 (1.4%)	1.380 (0.162, 11.742)	0.768
	Widowed	7 (3.3%)	10 (4.8%)	1.275 (0.161, 10.108)	0.818
Occupation	Farmer	12 (5.7%)	27 (12.9%)	1	0.005*
	Merchant	15 (7.2%)	22 (10.5%)	2.042 (0.518, 8.048)	0.308
	Employed	13 (6.2%)	17 (8.1%)	2.746 (0.462, 16.334)	0.267
	Non employed	5 (2.4%)	12 (5.7%)	0.734 (0.130, 4.136)	0.726
	House wife	24 (11.5%)	30 (14.4%)	9.857 (2.352, 41.310)*	0.002*
	Student	3 (1.4%)	19 (9.1%)	0.103 (0.009, 1.162)	0.066
	Other	3 (1.4%)	7 (3.3%)	1.423 (0.066, 30.727)	0.822
Number of diagnosed disease	One	33 (15.8%)	86 (41.1%)	2.275 (1.054, 4.908)*	0.036*
	Two or more	42 (20.1%)	48 (23.0%)	1	0.268
Average number of drugs/ day	≤ 5	20 (9.6%)	62 (29.7%)	1.541 (0.717, 3.312)	0.626
	>5	55 (26.3%)	72 (34.4%)	1	

**Table 10:** Predictors of non-compliance among hospitalized patients Gedo hospital, Gedo town, from March 15-May 11, 2018.

the concentration of drug (42.9%). The current outcome was similar to finding of Australia [14].

In the current study 35.9% of hospitalized patients were non-compliant. The most frequent reason for non-compliance were found to be that the patient prefers not to take the medication (26.7%), the patient doesn't understand the instruction and the patient forgets to take the medication were (18.7%). The other reasons were the drugs were not available for the patient (17.3%) and were too expensive for the patient (14.7%).

Drugs most often involved most often involved with need additional drug therapy were antibiotics (10.5%), FeSO<sub>4</sub> /folic acid and Digoxin

were (4.3%) in our results. ACE-I were involved with additional drug therapy need in similar study Jordan [15]. Anemia was also found to be disease which most frequently not managed by a study from Jordan [15] which was similar with that of our study.

In the present study 7.7%, 5.7%, 2.4% and 1.9% of patients were unnecessarily prescribed acid secretion inhibitor, antibiotic, diuretics and beta blockers respectively. Antibiotic and acid secretion inhibitors were drug classes found to be with unnecessary drug therapy which were similar with the study from Jordan [15]. Acid secretion inhibitors were involved with the unnecessary drug therapy in study from Australia [7].

Medical	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	5 (11.1%)
HO	1 (2.2%)	0 (0.0%)	1 (2.2%)	0 (0.0%)	2 (4.4%)
Nurse	13 (28.9%)	6 (13.3%)	6 (13.3%)	2 (4.4%)	2 (4.4%)
1	4 (8.9%)	3 (6.7%)	4 (8.9%)	0 (0.0%)	4 (8.9%)
2	2 (4.4%)	2 (4.4%)	0 (0.0%)	0 (0.0%)	4 (8.9%)
3	5 (11.1%)	2 (4.4%)	2 (4.4%)	2 (4.4%)	1 (2.2%)
4	2 (4.4%)	0 (0.0%)	0 (0.0%)	1 (2.2%)	0 (0.0%)
5	3 (6.7%)	1 (2.2%)	2 (4.4%)	0 (0.0%)	0 (0.0%)
≥6	1 (2.2%)	0 (0.0%)	0 (0.0%)	1 (2.2%)	0 (0.0%)
Yes	15 (33.3%)	6 (13.3%)	6 (13.3%)	3 (6.7%)	8 (17.8%)
No	1 (2.2%)	2 (4.4%)	2 (4.4%)	1 (2.2%)	1 (2.2%)
Due to emergency	11 (45.8%)	1 (4.2%)	4 (16.7%)	3 (12.5%)	5 (20.8%)
Due to miss diagnosis	6 (40.0%)	1 (6.7%)	2 (13.3%)	1 (6.7%)	5 (33.3%)
Lack of timely laboratory results	8 (44.4%)	3 (16.7%)	3 (16.7%)	1 (5.6%)	3 (16.7%)
Lack of medication guideline		2 (33.3%)	2 (33.3%)	1 (16.7%)	1 (16.7%)
Prioritizing the effectiveness of medication	-	-	1 (33.3%)	2 (66.7%)	-
Prioritizing cost of medication	-	-	1 (50.0%)	1 (50.0%)	-
Prioritizing safety of medication	-	-	1 (100%)	-	-
Prioritizing perceived patient demand of medication	(50.0%)	-	1 (50.0%)	-	-
Economic incentives from promoters	1 (16.7%)	1 (16.7%)	3 (50.0%)	1 (16.7%)	-
Fear of bad clinical outcome	-	-	1 (100%)	-	-
Shortage of knowledge	-	-	2 (66.7%)	1 (33.3%)	-

Table 11: Levels of Education.

In the current study 11.5%, 2.4% and 1.9% of admitted patients had ineffective drug therapy which involve antibiotic, Spironolactone and beta blockers respectively. Selection of antibiotics with similar receptors and mechanism of resistance to treat a disease which doesn't respond for the first antibiotic and empirical therapy with narrow spectrum antibiotics leads to increased involvement of antibiotics. The involvement of antibiotic and beta blockers in ineffective drug therapy was also found by similar studies [5,7,15].

In our study 2.9%, 1.9%, 1.9%, and 1.9% of admitted patients were prescribed steroid, antibiotic, diuretics and Digoxin with high dosage. On the other hand 2.9% and 1.9% of hospitalised patients were prescribed Spironolactone and antibiotic with low dosage, respectively. The involvement of antibiotic and steroid in inappropriate dosage was also found to be by similar studies [5,15].

In the present study 11%, 11%, 4.3% and 3.8% of hospitalised patient were non-compliant for antibiotic, Digoxin, ACE-inhibitor and antiviral. Non-compliance were due to staff by not administrating the patient on time, also they doesn't check whether the patient have gotten the drug or not. Most of the drugs were prescribed by the nurses, which they were so forgetfulness. Generally, antibiotics were the most important, were involved with all types of DRPs which was similar to a result from Norwegian study which states that antibiotic users have more DRPs than non-users.

In the current study; occupation [(COR=19.013, 95%CI (1.389, 260.3), p= 0.027)], number of diagnosed diseases [(COR=0.258, 95%CI (0.096, 0.696), p= 0.007)] and surgical ward [(COR=3.872, 95%CI (1.256, 11.935), p= 0.018)] were found to be independent predictors of which increase the chance of having drug related problems.

In the current study educational status [(COR=5.904, 95% CI (1.088, 32.029), p=0.040)] and number of drugs per day [(COR= 2.294, 95% CI (1.055, 4.989), p= 0.036)] were the independent predictors of need additional drug therapy when predictor variable were analysed for individual class of DRPs which has one similarity with the study from Jordan, which was number of medications were strongly associated with number of TRPs ( $r < 0.5$ ,  $p < 0.0001$ ) [15].

The present study sex [(COR= 5.277, 95%CI (1.043, 26.696), p=0.044)], educational status [(COR=0.101, 95% CI (0.017, 0.613), p=0.013)], polypharmacy [(COR=0.059, 95% CI (0.015, 0.241), p=0.000)], internal medicine P=0.005, surgery [(COR=10.509, 95%CI (2.223, 49.677), p=0.003)] and gynaecology [(COR=0.122, 95%CI (0.015, 0.966), p=0.046)] were independent predictors of unnecessary drug therapy. Polypharmacy were the only predictors which have similarity with the other studies [5,15,17,19]. The difference may be due to study population, area of the present study and the inclusion criteria.

Educational status [(COR=0.214, 95%CI (0.053, 0.858), p=0.030)] was the only independent predictor of the occurrence of ineffective drug. There was statistically significant association between surgical ward and high dosage from these studies both are different from the other studies. From these study, sex [(COR=0.216 95%CI (0.077, 0.605), p=0.004)], educational status (1-4), [(COR= 4.784, 95%CI (1.096, 20.884), p=0.037)], marital status (single and married) [P=0.038 and (COR=0.242, 95%CI (0.065, 0.906), p=0.035)], occupation (farmer and house wife) [p= 0.005 and COR=9.857, 95%CI (2.352, 41.310), p=0.002)], number of diagnosed disease [(COR=2.275, 95%CI (1.054, 4.908), p=0.036)] and surgical ward [(COR=0.288, 95%CI (0.093, 0.889), p=0.03)] were independent predictors of the occurrence of non-compliance.

## Conclusions and Recommendation

The prevalence of drug related problem was substantially high (75.6%). Furthermore, all classes drug related problem were common. A medical condition that requires initiation of drug therapy and preventive drug therapy required to reduce risk of developing a new condition or progression of the existing condition were more common reasons for need of additional drug therapy. Invalid indication for the drug therapy was the most frequent reason for unnecessary drug therapy. The drug was not the most effective for the medical condition was the leading reason for ineffective drug therapy. The presence of low dose prescribing and drug interaction which might decrease the concentration of a drug, were more common reasons for low dosage. Prescribing high dose and drug interaction which might increase the concentration of drug were common reasons for high dosage.

The patient prefers not to take the medication or forgets to take the medication and in availability of drug product were the most common reasons for non-compliance.

Antibiotics were mostly involved with all types of DRPs. FeSO<sub>4</sub> and/ folic acid and Digoxin were involved with need additional drug therapy. Acid secretion inhibitors were involved in unnecessary and need additional drug therapy. Beta blockers were involved with need additional drug therapy, unnecessary drug therapy and ineffective drug therapy. Salbutamol was involved in unnecessary drug therapy. Digoxin, ACE-I and anti-viral were involved with non-compliance.

Among all independent variables sex, educational status, marital status, occupation, taking five or more drugs and ward type were found to be the risk factors for DRPs with in the study period. Polypharmacy were found to affect unnecessary drug therapy and need additional drug therapy with in the study period. Sex, educational status, internal medicine, and gynaecology were independent risk factors for unnecessary drug therapy with in the study period. Surgical ward were found to effect unnecessary drug therapy, high dosage and non-compliance. Sex, educational status, marital status, occupation, number of diagnosed were independent risk factors for non-compliance.

### Recommendations

The current study showed how significant number of hospital admitted patients was affected by drug related problems. Since the presence of DRPs will affect the patient care service negatively, prevention and management of DRPs has undeniable importance. The following recommendations are forwarded to decrease DRPs among hospitalised patients.

- For a better delivery of health services with regard to patient care and management clinical pharmacist should be assigned to Gedo hospital. Clinical pharmacist being a member in a patient managing team at least to reduce DRPs among admitted patients by prevention whenever possible or early identification and management of DRPs working together with the other team members.
- For Patients who take five or more drugs per day and patients with two or more diagnosed disease should be given the priority for clinical pharmacy in Gedo hospital.

### Conflict of Interests

All authors declared that they have no conflict of interests. Jimma University covered only the survey cost for this study and there is no any funding organization.

### Authors' Contribution

Abiru Neme conceived and designed the protocol. Abiru Neme, contributed on data analysis, and checked the draft. Abiru Neme prepared manuscript. Abiru Neme read and approved the final paper.

### Acknowledgements

I would like to thank Gedo Hospital administrative as well as the administrative staffs for all the help and support given for me during the data collection period. I also thank Jimma university institute of health for permitting me to conduct this study.

### References

1. Ruths S, Viktil K, Blix H (2007) Classification of drug related problems. *Tidsskr nor Laedforen* 127: 3073-3076.
2. Mahmoud M (2008) Drug therapy problems and quality of life in patients with chronic kidney disease university sains Malaysia.
3. Pharmaceutical care network Europe. PCNE classification of drug related problems V5.01 2006.
4. Strand L, Morley P, Cippole R, Ransey R, Lamsam G (1990) Drug related problems: their structure and function. *Ann Pharmacother* 24: 1093-1097.
5. Blix H, Viktil K, Reikvam A, Moger T, Hjemaas B, et al. (2004) The majority of hospitalised patients have drug-related problems: Results from a prospective study in general hospitals. *Eur J Clin Pharmacol* 60: 651-658.
6. Zed P (2005) Drug related problems visits to the emergency department. *J Pharm Prac* 18: 329-335.
7. Roughead E, Barratt J, Gilbert A (2004) Medication-related problems commonly occurring in an Australian community setting. *Pharmacoepidemol Drug Saf* 13: 83-87.
8. Patricia MLA, van-den B, Toine CG, Egberts, Lolkje TW, et al. (2000) Drug-related problems in hospitalised patients. *drug saf* 22: 321-333.
9. Frank RE, Amy J (2001) Grizzle drug-related morbidity and mortality: Updating the cost-of-illness model. *J Am Pharm Assoc* 41: 192.
10. Blix H, Viktil K, Moger T, Reikvam A (2008) Risk of drug-related problems for various antibiotics in hospital: assessment by use of a novel method. *Pharmacoepidem Drug Safety* 17: 834-841.
11. Lopez A, Saliente T, Company E, Monsalve A, Cueva M, et al. (2010) A drug related problems at discharge programme CONSULTENOS. *Int J Pharm Pract* 18: 297-304.
12. Chan M, Nicklason F, Vial J (2001) Adverse drug events as a cause of hospital admission in the elderly. *Int Med J* 31: 199-205.
13. Nascimento Y, Carvalho W, Acurcio F (2009) Drug-related problems observed in a pharmaceutical care service, Belo Horizonte, Brazil. *Brazilian J Pharm Sci* 45: 321-332.
14. Stafford A, Tenni P, Peterson G, Jackson S, Hejlesen A, et al. (2009) Drug-related problems identified in medication reviews by Australian pharmacists. *Pharm World Sci* 31: 216-223.
15. AbuRuz S, Bulatova N, Yousef A, Al-Ghazawi M, Alawwa I, et al. (2011) A Comprehensive assessment of treatment related problems in hospitalized medicine patients in Jordan. *Int J Clin Pharm* 33: 501-551.
16. Rao D, Linda A, Robert S, Strand LM, Cipolle RJ (2007) Drug therapy problems found in ambulatory patient populations in Minnesota and South Australia. *Pharm World Sci* 29: 647-654.
17. Viktil K, Blix H, Moger T, Reikvam A (2006) Polypharmacy as commonly defined is an indicator of limited value in the assessment of drug related problems. *Br J Clin Pharmacol* 63: 187-195.
18. Koh Y, Kutty F, Li S (2005) Drug related problem in hospitalized patient on polypharmacy: the influence of age and gender. *Ther Clin Risk Manag* 1: 39-48
19. Rahmawati S, Pramaantra I, Rohmah W, Sulaiman S (2009) Polypharmacy and unnecessary drug therapy on geriatric hospitalized patients in Yogyakarta hospitals, Indonesia. *Int J Pharm Pharm Sci* 1: 6-11.