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Original Article

Drug-related problems among medical ward patients in Jimma university specialized hospital, Southwest Ethiopia

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ABSTRACT

Objective: The increasing number of available drugs and drug users, as well as more complex drug regimens led to more side effects and drug interactions and complicates follow-up. The objective of this study was to assess drug-related problems (DRPs) and associated factors in hospitalized patients.

Methods: A hospital-based cross-sectional study design was employed. The study was conducted in Jimma University Specialized Hospital, Jimma, located in the south west of Addis Ababa. All patients who were admitted to the medical ward from February 2011 to March 2011 were included in the study. Data on sociodemographic variables, past medical history, drug history, current diagnosis, current medications, vital signs, and relevant laboratory data were collected using semi-structured questionnaire and data collection forms which were filling through patient interview and card review. Data were analyzed using SPSS version 16 for windows. Descriptive statistics, cross-tabs, Chi-square, and logistic regression were utilized.

Findings: Out of 257 study participants, 189 (73.5%) had DRPs and a total of 316 DRPs were identified. From the six classes of DRPs studied, 103 (32.6%) cases related to untreated indication or need additional drug therapy, and 49 (15.5%) cases related to high medication dosage. Unnecessary drug therapy in 49 (15.5%) cases, low medication dosage in 44 (13.9%) cases, and ineffective drug therapy in 42 (13.3%) cases were the other classes of problems identified. Noncompliance in 31 (9.8%) cases was the least prevalent DRP. Independent factors which predicted the occurrence of DRPs in the study population were sex, age, polypharmacy, and clinically significant potential drug-drug interactions. The prevalence of DRPs was substantially high (73.5%).

Conclusion: Drug-related problems are common among medical ward patients. Indication-related problems, untreated indication and unnecessary drug therapy were the most common types of DRPs among patients of our medical ward.

Keywords: Drug-related problems; inappropriate dosage; ineffective drug therapy; unnecessary drug therapy

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INTRODUCTION

The increasing number of available drugs and drug users as well as more complex drug regimens led to more side-effects and drug interactions and complicates follow-up.[1] A drug-related problem (DRP) can be defined as an event or circumstance involving drug therapy that actually or potentially interferes with desired health outcomes.[2] DRPs are classified into seven classes, including: Need additional drug therapy, unnecessary drug therapy, ineffective drug, too low or too high dosage, adverse drug reactions, and noncompliance.[3]

Majority of hospitalized patients reported to have some kind of DRPs.[4-9] According to studies conducted in Norway, 2.6 DRPs occurred per patient in internal medicine ward and the presence of DRPs increased

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approximately linearly with the number of drugs used, for the range of one to more than 11 drugs.[5,10] DRPs affect health outcome negatively.[11] A prospective bedside clinical assessment from internal medicine ward in Jordan found that of the total patients, 98.3% had treatment related problems (TRPs) and on average 9.35 TRPs occurred per patient.[12]

Even though studies on DRPs from Africa and Ethiopia could not be found, it will not be difficult to judge the possible negative impacts of DRPs in patient care and management. Two important points can possibly indicate the presence of DRPs in hospitals of Ethiopia: The use of similar drug groups and individual drugs, which are causing DRPs in developed countries and the absence of clinical pharmacy services, which can minimize the occurrence of DRPs.

The objective of this study was to assess DRPs and associated factors in hospitalized patients among medical ward patients.

Table 1: Drug-related problems based on unmet drug-related needs

Drug-related needs	Categories of drug therapy problems
Indication	Unnecessary drug therapy Needs additional drug therapy
Effectiveness	Ineffective drug therapy Dosage too low
Safety	Adverse drug reaction Dosage too high
Compliance	Noncompliance

Table 2: Operational definition of the drug-related problem categories

Categories of drug therapy problems	Operational definition
Clinically significant drug-drug interactions	Interactions presented to have major or moderate severity and good or excellent documentations by Micromedex® health care series software; also, interactions indicated to have a life-threatening outcome, or when concurrent use is contraindicated by the manufacturers or concurrent use may result in a significant hazard to the patient and so dosage adjustment or close monitoring is needed by Stockley's drug interaction, 2009
Dosage	Includes the dose given, the frequency of administration and the duration of therapy
Dosage too high	The drug dosage is too high, which may result in undesirable effects
Dosage too low	The drug dosage is too low to produce the desired response
Effectiveness-related problems	Low dosage or ineffective drug therapy
Indication-related problems	Unnecessary drug therapy or need additional drug therapy
Inappropriate dosage	Too high or too low dosage
Ineffective drug therapy	The drug or the dosage form is not recommended for the condition at producing most effective desired response
Need additional drug therapy	Additional drug therapy is required to treat or prevent a medical condition or illness
Non compliance	The patient is not able or willing to take the drug therapy as intended and tend to take unprescribed drugs
Polypharmacy	Concomitant use of five or more drugs on average per day
Unnecessary drug therapy	Drug therapy when the patient does not have a clinical indication at the time of data collection

METHODS

A facility-based cross-sectional study design was employed to describe the context based on the specific place and time. The study was approved by Ethical Review Board of Jimma University. During the period from February 5, 2011 to March 21, 2011 two pharmacists and three graduating class pharmacy students have collected data from medical wards of Jimma University Specialized Hospital, Jimma, which is 345 Km from south west of Addis Ababa. Patients who were discharged before the collected data were

Table 3: Sociodemographic characteristics of the study patients in internal medicine ward, Jimma University Specialized Hospital (*N*=257)

Socio demographic variable	Frequency (%)
Age (mean±SD; years)	40.91±16.82
Sex	
Male	136 (52.9)
Female	121 (47.1)
Educational status	
Illiterate	161 (62.6)
Only able to read and write	5 (1.9)
Primary 1st cycle	24 (9.3)
Primary 2nd cycle	24 (9.3)
Secondary school	28 (10.9)
Postsecondary school	15 (5.8)
Marital status	
Married	196 (76.3)
Single	45 (17.5)
Divorced	1 (0.4)
Widowed	15 (5.8)
Occupation	
Farmer	92 (35.8)
Daily laborer	14 (5.4)
Trader	14 (5.4)
Government employee	22 (8.6)
House wife	72 (28.0)
Student	24 (9.3)
Others	19 (7.4)
Family size (people)	
≤5	139 (54.1)
>5	118 (45.9)

SD=Standard deviation

cross-checked are excluded from the study. Data on sociodemographic variables, past medical, and medication history, length of hospital stay, current diagnosis, laboratory values, vital signs, and current medications were recorded for each patient.

Pretested interview guided semi-structured questionnaire and data abstraction forms were used for data collection. The DRPs evaluation tool was prepared based on the categories and reasons for DRP by Strand *et al*.[3] Data collectors interviewed the patient and reviewed the patient chart. For identification of DRPs, some references were used including: Harrison's principles of internal medicine, 17th edition, Pharmacotherapy: A pathophysiologic approach, 7th edition, Applied therapeutics: The clinical use of drugs, Guidelines for management of opportunistic infections and antiretroviral treatment in adolescents and adults in Ethiopia, 2007, and standard treatment guideline for general hospital, 2010. Cockcroft-Gault equation was used to estimate glomerular filtration rate and the classification of creatinine clearance was done by considering glomerular filtration rate classification for chronic renal failure. The possible interaction between drugs was evaluated using the Micromedex® health care series software and Stockley's drug interactions 2009.

Drug-related problems are classified based on unmet drug-related needs according to Table 1. Operational definition of each category is presented in Table 2.

The covariates were selected after literature review and conceptual framework was done. The data from patient interview, data from abstraction forms and data from DRP evaluation questionnaire were analyzed, coded, and entered to SPSS for windows, version 16 statistical software. Data were analyzed again after the entry by calculating frequencies and observing inconsistencies. Descriptive statistical analysis and cross tabs were done. Logistic regressions with 95% confidence interval (CI) were done to find out statistical significance. Binary logistic regression was done to identify the crude odds ratio (COR); those variables, which were found significant by COR value was introduced to multiple logistic regression to identify significant associated factors. $P < 0.05$ was used to declare association.

The investigators were giving feedback and correction on a daily basis to the data collectors before they were deployed to the wards. Completeness, accuracy, and clarity of the collected data were checked carefully. Any error, ambiguity and incompleteness, which were

Table 4: Type of drug-related problems identified from patients admitted to medical wards

Categories of drug therapy problems	Frequency	Percentage of total problems (*N*=316)	Percentage of total patients (*N*=257)
Need additional drug therapy	103	32.6	40.1
High dosage	49	15.5	19.1
Unnecessary drug therapy	47	14.9	18.3
Low dosage	44	13.9	17.1
Ineffective drug therapy	42	13.3	16.3
Noncompliance	31	9.8	12.1

Table 5: Drug-related problems regarding the individual drugs among study patients

Drug/drug class	Need additional drug therapy no. (%)	Unnecessary drug therapy no. (%)	Ineffective drug therapy no. (%)	Low dosage no. (%)	High dosage no. (%)	Non-compliance no. (%)
Antimicrobials	17 (6.6)	24 (9.3)	12 (4.7)	22 (8.5)	14 (5.5)	10 (3.9)
ACE inhibitors	25 (9.7)	2 (0.8)	-	9 (3.5)	-	2 (0.8)
Vitamins and minerals	35 (13.7)	1 (0.4)	1 (0.4)	3 (1.2)	-	1 (0.4)
Beta blockers	11 (4.3)	4 (1.6)	8 (3.1)	-	-	-
Corticosteroids	-	2 (0.8)	1 (0.4)	3 (1.2)	9 (3.5)	1 (0.4)
Diuretics	6 (2.3)	-	2 (0.8)	1 (0.4)	2 (0.8)	8 (3.1)
Bronchodialators	-	8 (3.1)	9 (3.5)	-	-	1 (0.8)
CCBs	2 (0.8)	-	5 (1.9)	1 (0.4)	6 (2.3)	-
Laxatives	-	1 (0.4)	-	1 (0.4)	11 (4.3)	5 (1.9)
Digitalis	-	-	-	2 (0.4)	4 (1.6)	-
Narcotic analgesics	-	1 (0.4)	3 (1.2)	-	2 (0.8)	-
Antacids	-	4 (1.6)	-	-	-	-
NSAIDs	3 (1.2)	-	1 (0.4)	-	1 (0.4)	1 (0.4)
Oral hypoglycemic agents	1 (0.4)	-	-	1 (0.4)	-	-
Anticoagulants	1 (0.4)	-	-	1 (0.4)	-	-
Vasodilators	2 (0.8)	-	-	-	-	-
Antimuscarinics	-	-	-	-	-	1 (0.4)
Statins	-	-	-	-	-	1 (0.4)

ACE=Angiotensin converting enzyme, CCBs=Calcium channel blockers, NSAIDs=Nonsteroidal anti-inflammatory drugs

Table 6: Predictors of having drug-related problems in study patients

Variable	Drug-related problems (%)		COR (95% CI)	AOR (95%CI)
	Yes	No		
Age			1.01 (1.00-1.03)*	1.02 (1.00-1.04)*
Sex				
Male	92 (35.8)	44 (17.1)	1	1
Female	97 (37.7)	24 (9.4)	1.93 (1.08-3.42)*	1.95 (1.02-3.72)*
Length of hospital stay (days)				
≤7	116 (45.2)	53 (20.6)	1	1
>7	73 (28.4)	15 (5.8)	2.22 (1.16-4.23)*	1.61 (0.79-3.28)
Number of diagnosed diseases				
One	36 (14.0)	29 (11.3)	0.32 (0.17-0.58)*	0.53 (0.27-1.05)
Two or more	153 (59.5)	39 (15.2)	1	1
Organ function test done				
Yes	149 (58.0)	45 (17.5)	1	1
No	40 (15.6)	23 (8.9)	0.52 (0.28-0.97)*	0.71 (0.35-1.45)
Average number of drugs/day				
<5	141 (56.4)	63 (25.2)	1	1
≥5	44 (17.6)	2 (0.8)	9.83 (2.31-41.81)*	5.23 (1.15-23.75)*
Clinically significant potential drug-drug interaction				
Yes	41 (16.4)	1 (0.4)	18.22 (2.45-135.38)*	15.50 (2.00-119.91)*
No	144 (57.6)	66 (25.6)	1	1

COR=Crude odds ratio, AOR=Adjusted odds ratio, CI=Confidence interval.
*Statistically significant

not observed at the supervision phase were addressed on the following day before starting the next day activities. The DRP evaluation form was filled by a clinical pharmacist and an experienced internist. Three questionnaires, which couldn't be corrected in the following day were removed from the analysis.

RESULTS

Sociodemographic characteristics of the study patients (N = 257) are presented in Table 3.

Among patients involved in the study, 189 (73.5%) had DRPs. 97 (37.7%) had a single DRP. A total of 316 DRPs were identified (on average, 1.2 DRPs/patient). The frequency of DRPs based on unmet drug-related needs is presented in Table 4. DRPs regarding the individual drugs are presented in Table 5.

Perceived associated factors, which were found to be significant by binary regression were introduced to multiple logistic regression. From all covariates studied, females were 1.95 times more likely to have DRPs than males (adjusted odds ratio [AOR] =1.951 [95% CI: 1.022-3.725]). For each additional year increase in age, DRPs are more likely to increase by 1.02 times (AOR = 1.021 [95% CI: 1.001-1.041]). Patients who took ≥ 5 drugs/day on average, were 5.23 times more likely to have DRPs than patients who took < 5 drugs/day on average (AOR = 5.230 [95% CI: 1.151-023.753]). The odds of DRPs were 15.5 times higher among patients who had clinically significant potential drug-drug interaction in drug therapy regimen (AOR = 15.503 [95% CI: 2.004-119.914]) compared to patients who didn't have [Table 6].

DISCUSSION

The occurrence of DRPs among hospitalized patients is associated with different reasons and risk factors. Identifying these factors is crucial for the prevention and control of DRPs in an individual patient. Small number of studies from developed and middle income countries had identified the different classes of DRPs, the drugs involved with the respective class, the reasons, and risk factors associated with DRPs.

The current study showed that 73.5% of patients admitted to internal medicine ward within the study period had DRPs which was lower than what found in Norway (81%)[4] and Jordan (98.3%)[12] studies. The difference might be due to the exclusion of adverse drug reactions in the current study and dependency of DRP identification on national drug list, which could be expected to be lower in number and variety for Ethiopia than Jordan and Norway.

Indication-related problems, which include need additional drug therapy and unnecessary drug therapy were the leading DRPs identified. Effectiveness-related problems which include ineffective drug therapy and low dosage were the second prevalent groups of DRPs. Safety related problems include adverse drug reactions and high dosage. However, due to the limitation of the current study, this kind of DRP was assigned only for high dosage, which accounts a relatively high percentage of the total identified problems. Similarly, indication-related problems (need additional drug therapy and unnecessary drug therapy) followed by effectiveness-related problems (inappropriate drug and under dosage) were found to be a leading type

of DRPs in one study from Spain although the study was done on DRPs at discharge.[8] Noncompliance was found to be the least frequent problem among all DRPs in admitted patients in Jimma University Specialized Hospital medical ward, which was similar to the findings of other studies done elsewhere.[4,8,13,14] The close supervision by health professionals might lead to this low prevalence of noncompliance among hospital admitted patients.

In the current study, female sex, age, taking five or more drugs on average per day (polypharmacy) and having clinically significant potential drug-drug interaction were found to be independent predictors, which increase the chance of having DRPs. Number of medications used per day was also found to be a risk factor for increasing DRPs by similar studies.[4,5,12] However, sex and age were not found to affect DRPs in other studies.[5,12,15] This difference might be due to the poor economic power of females in Ethiopia, which might make female patients to refer to the hospital after multiple disorders were developed leading to multiple diagnosis and polypharmacy.

This study did not include adverse drug reactions, which is the most important type of DRPs. Adverse drug reaction was not included because of budget, time, and skilled personnel who can perform adverse drug reaction identification algorisms constraints. Lack of national drug-related forms designed at national level was also the other limitation of the study.

Regarding the current study outcomes, the health sector policy makers should consider to include clinical pharmacists in the hospital. The role of clinical pharmacists should also be geared to identify, solve, and prevent DRPs rather than overlapping on the already existing dispensing pharmacists.

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AUTHORS' CONTRIBUTION

Bereket Molla had contributed in proposal writing, data collection, data analysis, and write-up of the final research.

Daniel Daba had contributed in proposal writing and data analysis.

Belete Habte had contributed in proposal writing, data collection, and data analysis.

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