INTRODUCTION

A drug interaction occurs when a patient’s response to a drug is modified by food, nutritional supplements, formulation excipients, environmental factors, other drugs, or disease. Drug interactions are a major area of concern these days. The study of drug-drug, food-drug, and disease-drug interactions, and of genetic factors affecting pharmacokinetics and pharmacodynamics is expected to improve drug safety and will enable individualized drug therapy. Drug interactions are said to account for a number of severe adverse drug reactions, resulting in hospitalizations and emergency department visits. It is estimated that, in 2011, DDI contributed to about 56.4% of all ADR [1]. Furthermore, ADR due to DDI accounts for about 2.8% hospital admission every year [2]. Many adverse events can be prevented by identifying potential drug interactions (pDIs). However, certain conditions such as multiple disorders, chronic diseases, and polypharmacy may increase the risk of potential drug-drug interaction. In the elderly, concomitant use of several drugs (polypharmacy) is very common and carries a high risk of both drug-drug interaction and drug-disease. A study in 2010 reported that 558 (26.5%) of elder people taking medicines were exposed to at least one DDI [3]. It was reported in 2011 that 164 (75.9%) patients taking 7 or more drugs were having at least one potential drug-drug interactions (pDIDs) while 76 (73.8%) patients with a hospital stay of seven or more were at risk of DDI [4]. Patients with cardiovascular disorders are even at higher risk of DDI due to the number and types of drug they receive and the influence of heart disease on drug metabolism. A prospective study conducted in one of the teaching hospitals in India in 2011 indicated that the incidence of pDI among cardiac drugs in hospitalized patients is 30.67% [5]. A cross-sectional study conducted in the Pulmonology Department, Ayub Teaching Hospital, Pakistan, in 2011 showed that among 558 pDDIs, most were of moderate (53.6%) or major (34%), good (74.2%) or fair (16.3%), and delayed onset (70%) [4].

Diet and lifestyle can sometimes have a significant impact on drugs. These may occur of accidental misuse or due to lack of knowledge about the active ingredients involved in the relevant substances. Interactions between food and drugs may inadvertently reduce or increase the drug effect. Major side effects of some diet (food) on drugs include alteration in absorption of fatty, high protein, and fiber diets. Sixteen cohort and case–control studies reported an elevated risk of hospitalization in patients who were exposed to pDDIs [6]. Studying the drug-drug interactions, food-drug interactions, and disease-drug interactions is essential for the management of drug therapy. The exhaustive literature review revealed that studies have been conducted on the pDDIs in the departments. Hence, we carry out a study to assess the prevalence of drug-drug interactions, food-drug interactions, and disease-drug interactions.
METHODS
The research was conducted in three tertiary care hospitals, in Erode, for 12 months at the hospitalized cardiac and pulmonary patients. 1150 patients were taken in for the study, of which 685 were cardiac, and 465 were pulmonary patients. Exclusion criteria included out patients, patients <18 years of age, medical disability, and patients who are on Ayurveda, Siddha, or other alternative system of medicine. Consent was obtained from hospital authority and hospitalized patients. The data were collected from case sheets of hospitalized patients and direct patient interview from cardiac and pulmonary departments. Demographic information (age and sex), length of hospital stay, main diagnosis, number of drugs, and details of comorbidities were obtained from the clinical records. All medications that were prescribed, including routine and pro re nata (means as required) medications, were screened for pDDIs. pDDIs were detected using the Drug Interactions Checker within Micromedex®-2.7 and www.drugs.com. The detected DDIs were classified as major, moderate, and minor, relying on their severity of clinical significance and cross-over checked manually for the presence of enough published medical evidence for the recognized interacting markers. Primarily, based on the profile of medicines prescribed, the DDIs had been recognized and classified step with the Micromedex®-2.7 and www.drugs.com. In line with the types, pDDIs have been categorized as: Pharmacokinetics - absorption, distribution, metabolism, and excretion and pharmacodynamics - antagonism, synergism, and additive. In line with severity, pDDIs were labeled as: Major - the consequences are probably life threatening or capable of inflicting permanent harm; moderate - the outcomes may also cause deterioration in patients’ scientific fame and additional treatment or extension of hospital stay; and minor - the consequences are typically moderate. The effects can be bothersome or unnoticeable, but need to now, not considerably affect the healing outcome. Frequencies expressed as possibilities were used to summarize sex, diagnosis, number of medication dispensed frequency of pDDIs, the drugs concerned with the pDDIs, period of hospital stay and types, and severity of pDDIs.

RESULTS
A total of 1150 patients were admitted at the department of cardiac and pulmonary during the study period. Among these, 685 were cardiac and 465 were pulmonary patients. Of 685 cardiac patients, 524 (76.49%) had found to be pDDIs, 856 pDDIs were found at 524 cardiac patients, and 675 pDDIs were found at 465 pulmonary patients. It was found that patients were confirmed with minimum one or two pDDIs in both cardiac and pulmonary patients. Of which, 298 (56.87%) cardiac males and 199 (57.68%) pulmonary males were found to be higher pDDIs, compared to females. Incidences of pDDIs were found to be higher in the age group of 60–70 years in 193 (36.85%) cardiac and 146 (42.33%) pulmonary patients (Table 1). A study conducted by Chalkeba et al. reported an age group of 59–69 years [9], whereas a study conducted by Fita et al. reported that the majority of patients ages were between 70 and 74 years [10]. Older people were at high risk of developing an ADR due to pDDIs for several reasons. They are likely to have higher commodities and thus take several prescriptions and over the counter drugs. As people get older, the liver loses the ability to metabolize drugs. Furthermore, older people are more than twice as susceptible to ADRs as younger people. As people age, the amount of water in the body decreases and the amount of fat tissue relative to water increases. Furthermore, as people age, the kidneys are less able to excrete drugs into the urine, and the liver is less able to metabolize many drugs.

The study revealed 72.53% of cardiac and 62.31% of pulmonary cases, that the number of hospital stay was between 4–6 days (Table 1). Lubinga et al. conducted a study which showed that the majority of the cases the number of hospital stay were less than 6 days [11]. The likelihood of getting the multiple drugs increases with the increased length of hospital stay which in turn will increase the likelihood of pDDIs.

In our study, 51.90% of patients were prescribed with more than seven drugs in the cardiology department (Table 1). The study conducted by de Andrade et al. revealed that 40.6% of cases were prescribed between 13 and 16 drugs [12]. 56.52% of patients prescribed with between 5 and 6 drugs in the pneumology department. A study conducted by Imsall et al. showed that 54% of cases had more than seven drugs prescribed [4]. Masse et al. reported the concurrent use of three or more drugs increased the risk of ADEs by 1.4 times [13]. More the medications that are prescribed, the more the possibility of irrational polypharmacy. A study conducted by Doan et al. determined the probability of potent cytotoxic P450 (CYP 450) interactions in older hospitalized people taking more than five concurrent medicines [14]. Potential drug-drug interactions were present in 80% of people taking more than five concurrent medicines. People taking five concurrent medicines had a 50% probability of at least one drug interaction, each additional medicine adds a 1.2% increase in the risk of drug interactions.

The most common interacting pair at the cardiac department was found to be aspirin and clopidogrel, causing major pharmacodynamic interaction, with a frequency of 245 (3.7%). Another study conducted by Yanti et al. of drug-drug, drug-food, and drug-disease interactions and genetic factors affecting pharmacokinetics and pharmacodynamics is expected to improve drug safety and will enable individualized drug therapy.

The present study identified a total of 1150 patients admitted at the department of cardiac and pulmonary, during the study period. Among these, 685 were cardiac and 465 were pulmonary patients. Of 685 cardiac patients, 524 (76.49%) had found to be pDDIs, 856 pDDIs were found in 524 cardiac patients (Fig. 1). 675 pDDIs were found in 465 pulmonary patients. Out of which 298 (56.87%) cardiac male, and 199 (57.68%) pulmonary male were found to be higher pDDIs, compared to females (Table 1), similar to the study conducted by Mukesh et al., where male patients (67%) had a high frequency of cardiovascular incidence as compared to female patients (33%) [7]. Another study conducted by Mortaza et al. also reported that male patients had a higher cardiology (50.94%), pulmonary (56.41%), and pDDIs possible when compared to females in the present study may be the primary reason [8]. Another reason possibly will be the greater risk of cardiovascular and pulmonary disorders among male gender in comparison to female, and hence, there is a need for multiple drugs which ultimately result in drug interactions.

The study showed that the majority of the incidences of pDDIs were found to be higher in the age group of 60–70 years in 193 (36.85%) cardiac and 146 (42.33%) pulmonary patients (Table 1). A study conducted by Chalkeba et al. reported an age group of 59–69 years [9], whereas a study conducted by Fita et al. reported that the majority of patients ages were between 70 and 74 years [10]. Older people were at high risk of developing an ADR due to pDDIs for several reasons. They are likely to have higher commodities and thus take several prescriptions and over the counter drugs. As people get older, the liver loses the ability to metabolize drugs. Furthermore, older people are more than twice as susceptible to ADRs as younger people. As people age, the amount of water in the body decreases and the amount of fat tissue relative to water increases. Furthermore, as people age, the kidneys are less able to excrete drugs into the urine, and the liver is less able to metabolize many drugs.

DISCUSSION
DDIs are a major area of concern these days for the effective management of patient illness. It may create a considerable health hazard to the patients when the risk-benefit ratio of combining interacting drugs is not accurately estimated. It has already been approximated that the effect of drug interactions can range from any minor morbidity to fatal consequences. The study of drug-drug, drug-food, and drug-disease interactions and genetic factors affecting pharmacokinetics and pharmacodynamics is expected to improve drug safety and will enable individualized drug therapy.

In our study, the incidence of DDIs was found to be 54% in cardiac and 56% in pulmonary patients. Of 1150 patients, 685 were cardiac and 465 were pulmonary patients. The study revealed 72.53% of cardiac and 62.31% of pulmonary cases, that the number of hospital stay was between 4–6 days (Table 1). Lubinga et al. conducted a study which showed that the majority of the cases the number of hospital stay were less than 6 days [11]. The likelihood of getting the multiple drugs increases with the increased length of hospital stay which in turn will increase the likelihood of pDDIs.
observed a combination of diltiazem–amlodipine and spironolactone–potassium chloride [5]. Diltiazem may increase the serum amlodipine level by affecting CYP3A4, while the combination of spironolactone and potassium chloride will potentially increase potassium levels. The most common interacting pair at a pulmonology department in the present study was ranitidine–theophylline, which is a minor pharmacokinetic interaction, with a frequency of 195 (% Table 4). Another study conducted by Ismail et al. showed dexamethasone–rifampicin as the most common interacting pair [4]. Rifampin can reduce the pharmacological effects of corticosteroids (dexamethasone and prednisolone). It is suggested to monitor corticosteroid effects and increase the dose if necessary. A dose reduction may be necessary if rifampin is discontinued.

Table 1: Demographic profile of cardiac and pulmonary patients

| Parameter                     | Cardiac total number of patients n=524 (%) | Pulmonary total number of patients n=345 (%) |
|-------------------------------|------------------------------------------|---------------------------------------------|
| Gender-wise distribution      |                                          |                                             |
| Male                          | 298 (56.87)                              | 199 (57.68)                                |
| Female                        | 226 (43.13)                              | 146 (42.32)                                |
| Age-wise distribution         |                                          |                                             |
| 18–30                         | 83 (15.83)                               | 85 (24.63)                                 |
| 31–45                         | 380 (72.53)                              | 215 (62.31)                                |
| 46–59                         | 61 (11.64)                               | 45 (13.06)                                 |
| Number of hospital stay (in days) |                                         |                                             |
| <3                            | 94 (17.93%)                              | 54 (15.65)                                 |
| 4–6                           | 158 (30.15)                              | 195 (56.52)                                |
| >7                            | 272 (51.90)                              | 96 (27.82)                                 |
| Number of prescribed drugs per day |                                         |                                             |
| <4                            |                                          |                                             |
| 4–6                           |                                          |                                             |
| >7                            |                                          |                                             |

Table 2: Types of diseases in each department

| Type of diseases                        | Cardiology (n=524) | Pulmonary (n=345) |
|-----------------------------------------|--------------------|------------------|
| Myocardial infarction                   | 87 (16.60)         | Asthma           |
| Angina+diabetes mellitus                | 111 (21.18)        | Asthma+LRTI      |
| Hypertension                            | 165 (31.48)        | Pneumonia        |
| Ischemic heart disease                  | 46 (08.77)         | Pneumonia+bronchitis |
| Coronary artery disease                 | 34 (06.48)         | Bronchitis       |
| Chronic heart failure                   | 81 (15.45)         | COPD             |

LRTI: Lower respiratory tract infection, COPD: Chronic obstructive pulmonary disease

Table 3: Highest potential drug-drug interaction combinations in cardiology

| pDDI combination       | Type | Severity | Frequency n=856 (%) |
|-------------------------|------|----------|---------------------|
| T. aspirin+             | PD   | Major    | 245 (28.62)         |
| T. clopidogrel          | PD   | Moderate | 69 (0.86)           |
| T. aspirin+             | PK   | Moderate | 78 (9.11)           |
| T. enalapril            |       |          |                     |
| T. tolvaptatin+         | PK   | Moderate | 25 (2.92)           |
| T. amlodipine           |       |          |                     |
| T. spironolactone+      | PK   | Moderate | 80 (9.34)           |
| T. metformin            | PK   | Major    | 25 (2.92)           |
| T. enalapril+           |       |          |                     |
| T. metformin            |       |          |                     |
| T. furosemide           | PK   | Moderate | 12 (1.40)           |
| T. aspirin+             | PD   | Major    | 41 (4.78)           |
| T. spironolactone+      | PD   | Major    | 18 (2.10)           |
| T. enalapril            | Unknown | Major | 15 (1.75) |
| T. enalapril+           |       |          |                     |
| T. furosemide           | PD   | Moderate | 17 (1.40)           |
| T. aspirin+             | PD   | Major    | 51 (5.40)           |

PD: Pharmacodynamics, PK: Pharmacokinetics, pDDIs: Potential drug-drug interactions

Fig 1: Distribution of drug interactions in various departments

Fig 2: Prevalence of potential drug-drug interactions by Ismail et al. showed dexamethasone–rifampicin as the most common interacting pair [4]. Rifampin can reduce the pharmacological effects of corticosteroids (dexamethasone and prednisolone). It is suggested to monitor corticosteroid effects and increase the dose if necessary. A dose reduction may be necessary if rifampin is discontinued.
Table 4: Interactive effect, M.O.A, clinical management of common potential drug-drug interactions in cardiology

| pDDI combination | Mechanism of action | Interactive effect | Clinical management |
|------------------|---------------------|-------------------|-------------------|
| T. aspirin + T. clopidogrel | Increased risk of bleeding | Additive effect | Monitor for blood counts if coadministration is needed |
| T. aspirin + T. enalapril | Decreased effectiveness of enalapril | Antagonistic effect | Discontinue the statin and substitute a statin that is not metabolized by CYP3A4 (i.e., pravastatin or rosuvastatin) |
| T. atorvastatin + T. clopidogrel | Decreased formation of the clopidogrel active metabolite resulting in higher on-treatment platelet reactivity | Metabolism | Monitor for the patient’s blood counts and dose adjustment for beta blockers if necessary |
| T. aspirin + T. atenolol | Decreased antihypertensive effect | Antagonistic effect | Monitor for the patient’s blood counts and dose adjustment for beta blockers if necessary |
| T. clopidogrel + T. amlodipine | Decreased antplatelet effect and increased risk of thrombotic events | Inhibit | Avoid concurrent use |
| T. atenolol + T. metformin | Result in hypoglycemia or hyperglycemia | Altered glucose metabolism | Monitor for patient’s glucose level |
| T. enalapril + T. metformin | Result in hyperkalemia | Additive effect | Monitor for serum potassium level |
| T. enalapril + T. furosemide | Result in postural hypotension | Unknown mechanism | Discontinue the diuretic 2 or 3 days before ACEI |
| T. aspirin + T. spironolactone | Result in hyperkalemia, or possible nephrotoxicity | Synergistic effect | Avoid aspirin doses of >650 mg daily in adults |

Table 5: Highest potential drug-drug interaction combinations in pulmonary

| pDDI combination | Type | Severity | Frequency n=675 (%) |
|------------------|------|----------|-------------------|
| Injection ranitidine + Injection theophylline | PK | Minor | 195 (28.88) |
| Injection furosemide + Injection hydrocortisone | PD | Moderate | 68 (10.07) |
| Injection ciprofloxacin + Injection theophylline | PK | Major | 82 (12.14) |
| T. omeprazole + T. clopidogrel | PK | Major | 55 (8.14) |
| Injection furosemide + Injection theophylline | Unknown | Minor | 86 (12.74) |

The prevalence of pDDIs in the cardiac department in our study was 53.27% (Table 7 and Fig. 2). A similar study performed by Ismail et al. showed an overall 77.5% PDDI prevalence rate among randomly selected cardiac patients [4]. A study conducted by Murtaza et al. in the department of cardiology showed that the prevalence rate of PDDIs was 91.6% among the studied cardiac patients [8]. The prevalence of pDDIs in the pulmonary department in our study was 48.29% (Table 7). A similar study that was conducted by Ismail et al. reported an overall prevalence of 45% [4].

In our study, the prevalence of pDDIs was higher in major severity accounted at 456 (53.27%) cardiology and 326 (48.29%) pulmonary patients. Fokter et al. reported pDDIs of major severity in 13% of patients [15] and Ismail et al. in 24.25% of patients [3]. Prevalence of pDDIs of moderate severity was 30.94%. Patel et al. reported moderate severity in 60.3% of patients [5]. This study contrasts the other studies which report moderate severity. These potential DDIs suggest that there is a need for modification or alteration of therapy such as dosage adjustment. To prevent these DDIs, healthcare providers should have adequate information about DDIs not only through drug information center, which can provide evidence-based information to health-care professionals, but also through encouraging the empowerment of clinical pharmacists that can provide an evidence-based approach to drugs and thereby prevent drug therapy problems of which DDIs is one.

Of 524 cardiac cases, there were 82 interacting pairs identified during the study. Among 856 pDDIs, 256 (29.90%) were due to pharmacokinetic interactions, and 456 (53.27%) were pharmacodynamic interactions. 71 (8.29%) show both mechanisms and 73 (8.54%) were due to unknown mechanisms. Among 256 pharmacokinetic drug interactions, 39 (15.23%) were due to absorption, 41 (16.01%) were due to distribution, 141 (55.07%) were due to metabolism, and 35 (13.67%) were due to excretion. Among 456 pharmacodynamic interactions, 28 (6.14%) were synergistic, 115 (25.21%) were antagonistic, 294 (64.47%) were added, and 19 (4.18%) with both additive and antagonistic effects. According to Chavda et al., among 423 pDDIs, 50.83% were pharmacokinetic drug interactions, 38.53% were pharmacodynamic interactions, 10.64% were both kinds of mechanisms (Fig. 3) [16]. From 163 pharmacokinetic pDDIs, 45.41% were altered the absorption, 28.99% were altered the metabolism, and 25.60% were altered the excretion. Of the 215 pharmacodynamic pDDIs, 67.44% were synergistic, 30.70% antagonistic, and 1.86% unknown in nature. The reason for the majority being pharmacodynamic interaction is that these types of interactions derive from modification of the action of one drug at the target site by another drug, independent of a change in its

Fig 3: Classification of types of potential drug-drug interactions
Interactions between food and drugs may inadvertently reduce or attenuate response (antagonism), or an abnormal response (side effects). These may occur out of accidental misuse or due to lack of knowledge about the active ingredients involved in the relevant substances. Interactions between food and drugs may inadvertently reduce or increase the drug effect. Major side effects of some diet (food) on drugs may contribute to the decrease in glucose utilization [21].

A total of 1150 patients were studied at cardiology and pulmonary departments. Among these, 685 were cardiac and 465 were pulmonary patients. Of 685 cardiac patients, 290 (42.33%) were found to be drug-food interactions (DFIs). 457 pDDIs were found in 290 cardiac patients. 278 pDDIs were found in 165 pulmonary patients. The most common pDDIs were between atorvastatin and citrus fruits, in cardiac patients, with a frequency of 144 (Table 8), which may cause decreased first-pass metabolism and increased bioavailability of atorvastatin that further results in muscle breakdown, liver damage, digestive problems, increased blood sugar, and neurological side effects. The reason for these interactions is due to furanocoumarins. The interaction between citrus fruits and medications poses dangers only if a drug is taken orally because the interaction occurs in the digestive tract. The second most common interaction was banana interacting with the ACE inhibitors, with a frequency of 83, to cause hyperkalemia [19]. Bananas are high in potassium. Too much potassium can cause an irregular heartbeat and heart palpitations.

Table 6: Interactive effect, M.O.A, clinical management of common potential drug-drug interactions in pulmonology

| pDDI combination          | Mechanism of action                        | Interactive effect     | Clinical management                                                                 |
|---------------------------|--------------------------------------------|------------------------|--------------------------------------------------------------------------------------|
| Injection nimididine+Injection theophylline | Theophylline toxicity (nausea, vomiting, palpitations, seizures) | Decrease metabolism    | Dosing adjustments of theophylline may be necessary                                  |
| Injection furosemide+Injection hydrocortisone | Result in hypokalemia                   | Antagonistic effect; additive effect | Potassium balance should be carefully monitored during concomitant therapy           |
| Injection ciprofloxacin+Injection theophylline | Theophylline toxicity (nausea, vomiting, palpitations, seizures) | Decreased metabolism    | Serum levels of theophylline should be monitored and dosage adjustments made as appropriate |
| C. omeprazole+T. clopidogrel | Reduction in clinical efficacy of clopidogrel and increased risk for thrombosis | Inhibit metabolism     | Avoid concomitant use of clopidogrel and omeprazole                                  |
| Injection furosemide+Injection theophylline | Altered theophylline concentrations       | Unknown                | Dosing adjustments of theophylline may be necessary                                  |

Table 7: Prevalence of pDDIs

| Type of prevalence | Cardiology | Pulmonary |
|--------------------|------------|-----------|
| Severity of pDDIs  | Frequency  | Frequency n=675 (%) |
| n=856 (%)          | 456 (53.27) | 326 (48.29) |
| Major              | 251 (29.33) | 217 (32.16) |
| Moderate           | 149 (17.40) | 132 (19.55) |
| Minor              |            |            |

Diet and lifestyle can sometimes have a significant impact on drugs. These may occur out of accidental misuse or due to lack of knowledge about the active ingredients involved in the relevant substances. Interactions between food and drugs may inadvertently reduce or increase the drug effect. Major side effects of some diet (food) on drugs include alteration in the absorption of fatty, high protein, and fiber diets.
Table 8: Distribution of potential DFIIs in cardiology

| Drug-food | Interactive effect | Type of DFI | Severity | Frequency n=457 (%) |
|-----------|-------------------|-------------|----------|-------------------|
| T. atenolol with citrus fruits | Decreased first-pass metabolism and increased bioavailability | PK | Moderate | 144 (31.50) |
| T. enalapril with banana | Hyperkalemia | Unknown | Moderate | 47 (10.28) |
| T. atenolol with orange juice | Decrease the mean peak plasma concentration of atenolol; excretion of drugs in urine decreased | PK | Moderate | 79 (17.28) |
| T. diazepam with tea/coffee | Antagonistic effect. Caffeine generally antagonized the diazepam-induced ratings of sedation and impairment of psychomotor performance | PD | Minor | 83 (18.16) |
| T. Bisacodyl with milk | Increase the risk of stomach upset and nausea | Unknown | Minor | 91 (19.91) |
| T. paracetamol with cabbage | Decrease effectiveness of the drug | PK | Moderate | 38 (8.31) |

Table 9: Distribution of potential DFIIs in pulmonology

| Drug-food | Interactive effect | Type of DFI | Severity | Frequency n=278 (%) |
|-----------|-------------------|-------------|----------|-------------------|
| T. theophylline with coffee/tea (caffeine) | Increased plasma concentration by inhibiting metabolism | PK | Moderate | 120 (43.16) |
| T. theophylline with protein-rich foods (fish, milk, egg, meat) | Increased clearance of the drug | Unknown | Moderate | 55 (19.78) |
| T. paracetamol with cabbage | Decrease effectiveness of the drug | PK | Moderate | 22 (7.91) |
| T. ciprofloxacin with tea/coffee (caffeine) | Increased caffeine concentrations and enhanced CNS stimulation | PK | Moderate | 68 (24.46) |
| T. ciprofloxacin with milk/curd | Decreased drug concentration | PK | Moderate | 65 (23.38) |

Table 10: Distribution of potential drug-disease interactions in cardiology

| Drug-disease | Interactive effect | Severity | Frequency n=289 (%) |
|--------------|-------------------|----------|-------------------|
| T. ISDN with MI Injection furosemide with diabetes mellitus | Systemic hypotension and tachycardia | Major | 42 (14.53%) |
| T. atenolol with DM | Latent diabetes may become overt; Insulin requirements in established diabetes may increase: Stop furosemide before a glucose tolerance test | Major | 56 (19.37) |
| T. enalapril with CHF | Inhibit catecholamine-mediated glycogenolysis, thereby potentiating insulin-induced hypoglycemia and delaying the recovery of normal blood glucose levels | Major | 24 (8.30) |
| T. amiodipine with CAD | Oliguria and/or progressive azotemia, and rarely, renal failure, myocardial ischemia, and death | Major | 28 (9.68) |

Table 11: Distribution of potential drug-disease interactions in pulmonology

| Drug-disease | Interactive effect | Severity | Frequency n=138 (%) |
|--------------|-------------------|----------|-------------------|
| T. diazepam with COPD | Risk of respiratory depression | Moderate | 76 (55.07) |
| T. chlorpheniramine with COPD | Reduce the volume and cause thickening of bronchial secretions, resulting in obstruction of the respiratory tract | Moderate | 62 (44.93) |

CONCLUSION

This study concluded that the overall incidence of the pDDIs was very high in cardiology when compared to pulmonology department. It was found that the incidence of pDDIs was associated with older age, male gender, number of medication given, and increased length of hospital stays. To reduce pDDIs, the number of medications for the patients need to properly controlled and it is recommended to eliminate all medications without therapeutic benefit, the goal, and indication. All potential DDIs are not equally harmful; therefore, identification of the level of each potential DDIs is integral to assess the clinical importance and appropriate management. Food-drug interactions can produce negative effects on the safety and efficacy of drug therapy as well as nutritional status of patients. Often, such interactions can be avoided by taking 1 h before or 2 h after eating. Therefore, providing information regarding the different food and drug interactions will help the physicians to prescribe drugs cautiously with only suitable food supplement to get maximum benefit for the patient. Our study reports several examples of interactions between drugs and diseases. Guideline developers could consider a more systematic approach regarding the potential for drug-disease interactions, based on epidemiological knowledge of the commodities of people with the disease, the guideline is focused on and should particularly consider whether cardiovascular diseases are common in the target population. Knowledge of such predictable or possible interactions is necessary for their timely detection and prevention of associated morbidity.

Pharmacists must take responsibility for observing for drug interactions and informing the doctor and the patient about potential issues. With their point-by-point information about drugs, pharmacists have the capacity to relate unforeseen side effects experienced by patients inconceivable adverse effects of their drug therapy.

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AUTHORS’ CONTRIBUTION
All the authors have contributed equally.

CONFLICTS OF INTEREST
All authors have no conflicts of interest to declare.

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