Atorvastatin Prescribing Pattern at a Public Hospital in Alkharj

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Authors’ contributions

This work was carried out in collaboration between both authors. Author NJA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author MAM managed the analyses of the study. Author NJA managed the literature searches. Both authors read and approved the final manuscript.

ABSTRACT

Introduction: Atorvastatin is one of the frequently used Statins. If it is used inappropriately it could lead to several adverse effects, interactions and efficacy will be decreased.

Aim: This study aims to monitor the prescribing pattern of atorvastatin at a public hospital in Alkharj.

Methodology: This is a cross-sectional study was conducted at a public hospital in Alkharj. The data were extracted from the electronic records of 564 patients who received antihyperlipidemic drugs.

Results: The majority of the prescribing physicians were residents. The majority of the prescriptions were prescribed by the internal medicine department. Antiplatelet agents were the most common classes of cardiovascular drugs that were combined with atorvastatin.

Conclusion: It is important to prescribe atorvastatin appropriately to increase its efficacy and to decrease its adverse drug reactions. There are several strategies to improve atorvastatin use including increase the awareness of the health-care professionals and by implementing checking practice before dispensing the prescriptions.

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1. INTRODUCTION

Cardiovascular diseases (CVDs) in general affect the heart and the circulatory system. These diseases include ischemic heart disease, hypertension, congestive heart failure, peripheral artery disease and stroke. There are several modifiable risk factors of CVDs that include tobacco use, unhealthy diet, sedentary lifestyle, obesity and abnormal blood lipid profile [1]. World Health Organization (WHO) stated that most of the CVDs can be prevented by changing the behavioral risk factors such as the unhealthy diet, tobacco use, physical inactivity, harmful use of alcohol and obesity [2].

Al-Kindi et al reported that CVDs affect about one-third of the patients and remain the major cause of death in the United States [3]. Jager-Geurts et al stated that CVDs account for approximately 33% of deaths in both men and women [4]. So it is important to optimize preventive measures to decrease its occurrence.

Various classes of drugs are available for the prevention and the management of CVDs. Commonly used drugs are calcium channel blockers, vasodilators, diuretics, beta-blockers, angiotensin receptor blockers, angiotensin-converting enzyme inhibitors, lipid-lowering agents and antiplatelet agents [5].

Statins are effective lipid-lowering agents [6]. The beneficial effects of statin in the prevention of CVDs have been well documented in numerous randomized controlled trials [7-9]. Atorvastatin which is frequently used is approved by the Food and Drug Administration (FDA) [10]. If inappropriately prescribed, it may lead to high chances of adverse effects and may compromise its efficacy. The prescribing pattern is very useful in monitoring and evaluation of the drug's use. Moreover, the study of prescribing pattern recommends necessary modifications in the treatment to ensure that the drug is used rationally and to help in providing cost-effective patient care [11, 12]. This study aimed to monitor the prescribing pattern of atorvastatin at a public hospital in Alkharj.

2. METHODOLOGY

A cross-sectional study was conducted at a public hospital in Alkharj. The prescription data for atorvastatin use were extracted from the electronic records of 564 patients who received antihyperlipidemic drugs.

The patients who received atorvastatin in 2018 were included and all others were excluded. Atorvastatin was used by 351 patients; the experience of using atorvastatin in these patients was evaluated.

After the approval of the study by the Internal Review Board (IRB) ethical committee in the hospital, the data were collected and analyzed using Excel software. The descriptive data were represented by frequencies and percentages.

The data include personal data, the dispensing of atorvastatin during different months in 2018, the level of the prescribers, the departments that prescribed atorvastatin for outpatients, the classes of cardiovascular drugs that were combined with atorvastatin and the combination between atorvastatin with other cardiovascular medications.

3. RESULTS

Out of 564 outpatient prescriptions contained antihyperlipidemic drugs in 2018, there were 351 atorvastatin prescriptions (62.23%). About 59.54% of the patients were male. Table 1 shows the personal data of the patients who received atorvastatin.

Most of the atorvastatin prescriptions were prescribed in October followed by April. The dispensing of atorvastatin in different months in 2018 (Table 2).

The majority of the prescribing physicians were residents (68.66%). The level of the prescribers (Table 3).

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Out of 351 prescriptions, 236 prescriptions included combination of atorvastatin with other cardiovascular medications. Antiplatelet agents were the most common classes of cardiovascular drugs that were combined with atorvastatin. Out of 502 cardiovascular medications that were combined with atorvastatin, antiplatelet agents were the most common (33.27%) as in Table 5.
Atorvastatin and aspirin were the most common (46.62\%) combination among the combinations between atorvastatin and other cardiovascular medications. Table 6 shows other cardiovascular medications prescribed along with atorvastatin.

4. DISCUSSION

Out of 564 outpatient prescriptions contained antihyperlipidemic drugs in 2018, there were 351 atorvastatin prescriptions (62.23\%). Similarly, Solanki et al. reported that atorvastatin was the most commonly prescribed antihyperlipidemic drug (52.5\%) [13]. Nooreen et al reported that atorvastatin (82.85\%) was found to be the most highly prescribed drug [14]. Moreover, Vakade et al reported that atorvastatin (73.17\%) was the most commonly prescribed hypolipidemic drug [15]. Likewise, Thomas et al stated that among the antihyperlipidemic prescribed, 83.16\% of patients were prescribed atorvastatin [16].

In contrast to the result of the present study, Demoz et al. reported that the most commonly prescribed statin was simvastatin (37.2\%) followed by atorvastatin (32.8\%) and rosuvastatin (15.6\%) [17]. In addition to that, Teeling et al. stated that pravastatin was the most frequently prescribed statin [18].

The majority of the prescribing physicians were residents who have less experience than other consultants and specialists, these residents usually require more efforts to increase their awareness and their prescribing practices to prescribe atorvastatin appropriately. The majority of the prescriptions were prescribed by doctors in internal medicine department followed by doctors in cardiology department, this is rational because in this department the patients usually have CVDs or at high risk for developing CVDs.

About 67.23\% of the atorvastatin prescriptions included combination of it with other cardiovascular medications. Antiplatelet agents were the most common classes of cardiovascular drugs that were combined with atorvastatin. Atorvastatin and aspirin was the most common combination among medications against cardiovascular diseases.

Table 1. The personal data of the patients who received atorvastatin

| Variable | Category | Number | Percentage |
|----------|----------|--------|------------|
| Gender   | Male     | 209    | 59.54\%    |
|          | Female   | 142    | 40.46\%    |
| Nationality | Saudi   | 239    | 68.09\%    |
|          | Non- Saudi | 112   | 31.91\%    |
| Age      | 20-29    | 4      | 1.14\%     |
|          | 30-39    | 15     | 4.27\%     |
|          | 40-49    | 67     | 19.09\%    |
|          | 50-59    | 94     | 26.78\%    |
|          | 60-69    | 86     | 24.50\%    |
|          | 70-79    | 56     | 15.95\%    |
|          | 80-89    | 23     | 6.55\%     |
|          | 90-99    | 6      | 1.71\%     |

Table 2. The dispensing of atorvastatin during different months in 2018

| Month    | Number of prescriptions | Percentage |
|----------|-------------------------|------------|
| January  | 23                      | 6.55\%     |
| February | 35                      | 9.97\%     |
| March    | 37                      | 10.54\%    |
| April    | 41                      | 11.68\%    |
| May      | 30                      | 8.55\%     |
| June     | 19                      | 5.41\%     |
| July     | 39                      | 11.11\%    |
| August   | 18                      | 5.13\%     |
| September| 19                      | 5.41\%     |
| October  | 42                      | 11.97\%    |
| November | 24                      | 6.84\%     |
| December | 24                      | 6.84\%     |
Table 3. The level of the prescribers

| Prescribers level | Number | Percentage |
|-------------------|--------|------------|
| Consultant        | 46     | 13.11%     |
| Resident          | 241    | 68.66%     |
| Specialist        | 64     | 18.23%     |

Table 4. The departments that prescribed atorvastatin for outpatients

| Department                | Number of prescriptions | Percentage |
|---------------------------|-------------------------|------------|
| Internal Medicine         | 146                     | 41.60%     |
| Cardiology                | 114                     | 32.48%     |
| Emergency                 | 59                      | 16.81%     |
| Neurology                 | 16                      | 4.56%      |
| Nephrology                | 13                      | 3.70%      |
| Gastroenterology          | 1                       | 0.28%      |
| Ophthalmology             | 1                       | 0.28%      |
| Thoracic Surgery          | 1                       | 0.28%      |

Table 5. The classes of cardiovascular drugs that were combined with atorvastatin

| Cardiovascular drug       | Number | Percentage |
|---------------------------|--------|------------|
| Antiplatelet Agents       | 167    | 33.27%     |
| Diuretics                 | 68     | 13.55%     |
| Beta-Blockers             | 64     | 12.75%     |
| ACE Inhibitors            | 62     | 12.35%     |
| Calcium Channel Blockers  | 60     | 11.95%     |
| Nitrates                  | 32     | 6.37%      |
| Angiotensin II Receptor Blockers | 27      | 5.38%     |
| Others                    | 22     | 4.38%      |

*Some prescriptions contain more than 2 drugs so the sum of the percentages is more than 100%

Table 6. Other cardiovascular medications combined with atorvastatin

| Cardiovascular medications | Number | Percentage |
|-----------------------------|--------|------------|
| Aspirin                     | 110    | 46.61%     |
| Amlodipine                  | 54     | 22.88%     |
| Clopidogrel                 | 53     | 22.45%     |
| Bisoprolol                  | 48     | 20.34%     |
| Furosemide                  | 36     | 15.25%     |
| Isosorbide Dinitrate        | 32     | 13.56%     |
| Lisinopril                  | 29     | 12.29%     |
| Captopril                   | 18     | 7.63%      |
| Indapamide                  | 13     | 5.51%      |
| Enalapril                   | 11     | 4.66%      |
| Metoprolol                  | 11     | 4.66%      |
| Spironolactone              | 11     | 4.66%      |
| Valsartan                   | 10     | 4.24%      |
| Telmisartan                 | 9      | 3.81%      |
| Digoxin                     | 8      | 3.39%      |
| Hydrochlorothiazide         | 8      | 3.39%      |
| Olmesartan                  | 8      | 3.39%      |
| Others                      | 33     | 13.98%     |

*Some prescriptions contain more than 2 drugs so the sum of the percentages is more than 100%

In patients who do not achieve their low-density lipoprotein (LDL) goals, the best choices for initial therapy could be atorvastatin and simvastatin [19]. Atorvastatin and fluvastatin do not require dosage adjustments in patients with renal impairment [19]. The most important adverse
effects associated with different statins such as atorvastatin, pravastatin, fluvastatin, rosuvastatin, simvastatin and lovastatin are asymptomatic increases in liver transaminases and myopathy [20]. Regarding drug-drug interactions, statins including atorvastatin interact with several medications. Zhelyazkova-Savova et al reported that potential statin-drug interactions as a whole are common in hospitalized patients who have CVDs they also stated that nearly 1 out of 5 patients who receive a statin drug is exposed to at least one co-prescription that can be related to adverse drug reactions [21].

In the present study, atorvastatin was prescribed with several cardiovascular medications. There are many drug interactions between atorvastatin and other cardiovascular medications that could be major such as interactions with digoxin, diltiazem, fenofibrate and verapamil. Additionally, there were some moderate interactions with amiodarone and clopidogrel [22].

5. CONCLUSION
Statins medications are prescribed commonly in patients with CVDs or in patients with risk factors to develop CVDs. Atorvastatin was one of the most commonly prescribed statin especially in cardiology and internal medicine departments. It is recommended for use to prevent cardiovascular diseases due to its proven efficacy. It should be correctly prescribed to maximize efficacy and minimize adverse drug reactions. Strategies to improve the best use of atorvastatin include acquiring adequate information and knowledge among as well as correct prescriptions by doctors and dispensing of the drug.

CONSENT
As per international standard or university standard, patient's consent has been collected and preserved by the authors.

ETHICAL APPROVAL
After the approval of the study by the Internal Review Board (IRB) ethical committee in the hospital, the data were collected and analyzed using Excel software.

DISCLAIMER
The products used for this research are commonly and predominantly use products in our area of research and country. There was no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by the personal efforts of the authors.

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COMPETING INTERESTS
Authors have declared that no competing interests exist.

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