

Hydroxychloroquine, Azithromycin, and Chloroquine Prescribing Patterns in Medicaid

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Abstract

Over the last year, the COVID-19 pandemic has claimed the lives of many people throughout the world. As the virus spreads, affecting millions of patients, there has been a massive movement to discover readily available and effective treatment options (1). Inconsistent information regarding the benefits of hydroxychloroquine/chloroquine and azithromycin in COVID-19 treatment has been an obstacle in the delivery of clinical care during the pandemic (2). Limited data regarding the evolution of these therapies has created a knowledge gap that we aim to address by analyzing the experimental treatment options of COVID-19 using drug prescription patterns. This study used data from the Medicaid State Drug Utilization database and the Micromedex database to gather information on prescribed hydroxychloroquine, chloroquine, and azithromycin in Medicaid from 2016 to 2020. Our results show a decrease in azithromycin (-45.63%) and chloroquine prescription (-18.9%) from 2016 to 2020, and an increase in hydroxychloroquine prescription (+19.8%). Additionally, our results show a decrease in the average cost for hydroxychloroquine (-74.2%) and azithromycin (-20.4) and an increase in the average cost of chloroquine (138.4%). The increase in the number of prescriptions for hydroxychloroquine from quarter 1 of 2020 to quarter 3 of 2020 can be secondary to the COVID-19 pandemic in states, whereas the decrease in azithromycin prescriptions from 2016 to 2020 can be linked to emergence of new antibiotics with stronger function.

Introduction

Hydroxychloroquine and chloroquine are antimalarial drugs used to treat autoimmune diseases and prevent malaria. Use of these drugs have been rising in the United States (U.S.) as an experimental treatment option for COVID-19 (3). Azithromycin is an antimicrobial drug used to treat various bacterial infections such as chlamydia, mycoplasma, and mycobacterium (4). Hydroxychloroquine, with or without azithromycin, has been considered as a possible therapeutic agent for patients with COVID-19 (5).

We explored the prescribing patterns and changes in average cost of hydroxychloroquine, azithromycin, and chloroquine in Medicaid throughout the U.S. in 2016 through 2020. We hypothesized that there was an increase in prescribing patterns of hydroxychloroquine, azithromycin, and chloroquine secondary to the COVID-19 pandemic.

Methods

Procedures

We examined the prescribing patterns of hydroxychloroquine, azithromycin, and chloroquine prescribing patterns in Medicaid. The Micromedex database was used to find drug trade names. The Medicaid State Drug Utilization database served as a reference to extract the total number of prescriptions per state per quarter during 2016 to 2020. It was also used to gather information about enrollees and the total amount reimbursed. Statistics: For data analysis, a combination of Excel, Google sheets, and GraphPad Prism were used to create bar graphs, line graphs and to perform calculations.

Results

The total number of prescriptions for azithromycin was 8,715,064; 8,206,847; 7,167,437; 6,836,130 and 4,459,327 for 2016, 2017, 2018, 2019, and 2020, respectively (Figure 1A and B). From 2016 to 2020, there was a decrease of 45.63% (Figure 2) in azithromycin for the total number of prescriptions per 100,000 Medicaid enrollees. The total number of prescriptions for hydroxychloroquine was 634,914; 680,191; 673,354; 629,653 and 716,091 for 2016, 2017, 2018, 2019, and 2020, respectively (Figure 1A and B). There was an increase in the total number of prescriptions per 100,000 Medicaid enrollees for hydroxychloroquine by +19.8% (Figure 2). The number of prescriptions for chloroquine was 2,264; 2,676; 2,850; 2,435 and 1,728 for 2016, 2017, 2018, 2019, and 2020, respectively (Figure 1). There was an overall decrease of -18.9% in the total number of prescriptions per 100,000 Medicaid enrollees for chloroquine (Figure 2).

The average cost for azithromycin was \$12.95 in 2016 and \$10.30 in 2020 with a percentage decrease of -20.4% from 2016 to 2020 (Figure 3). The average cost of hydroxychloroquine was \$103.5 in 2016 and \$26.67 in 2020 with a percentage decrease of -74.2% from 2016 to 2020 (Figure 3). Our results indicated an increase in the average cost of primaquine by +139.42% from 2016 to 2020 (Figure 3).

The prescribing pattern in 2020 for quarter 1 and quarter 2 is shown in Figure 4. There was an overall increase in the number of prescriptions of hydroxychloroquine from quarter 1 of 2020 to quarter 3 of 2020. There was a decrease in number of prescriptions of azithromycin from quarter 1 (1,721,804) to quarter 2 (791,207) but an increase in the number of prescriptions from quarter 2 of 2020 to quarter 3 (919,385) and quarter 4 (1,026,931) of 2020. The prescribing pattern for chloroquine stayed relatively constant through 2020.

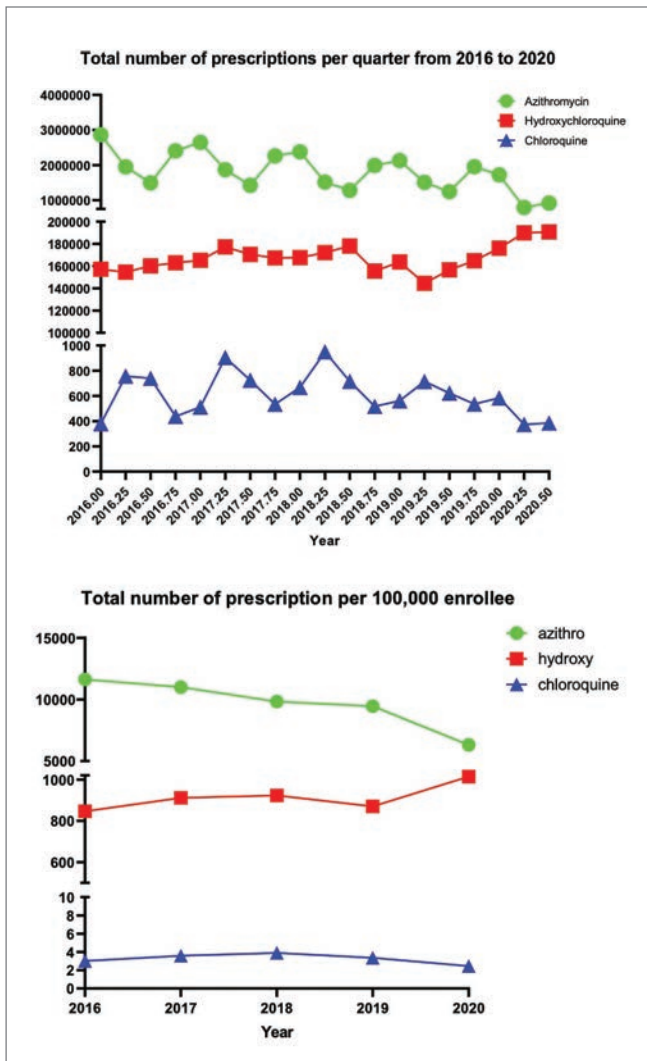


Figure 1. (A) Total number of prescriptions per quarter from 2016 to 2020 from Medicaid and (B) total number of prescriptions per 100,000 enrollees in Medicaid.

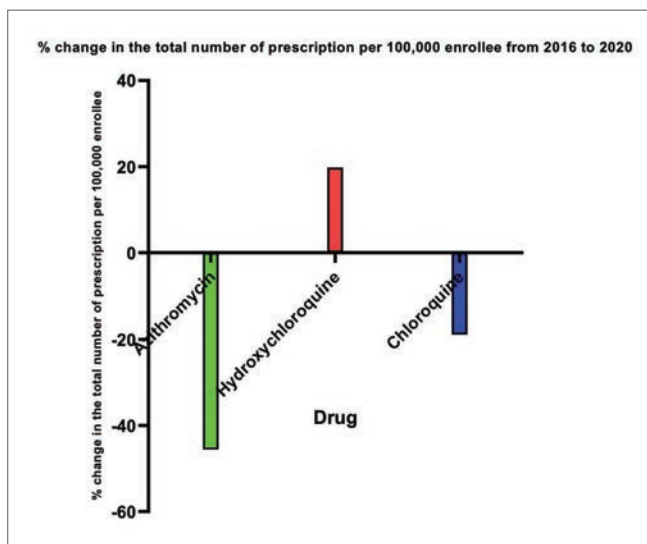


Figure 2. Percentage change in the total number of prescriptions per 100,000 enrollees from 2016 to 2020

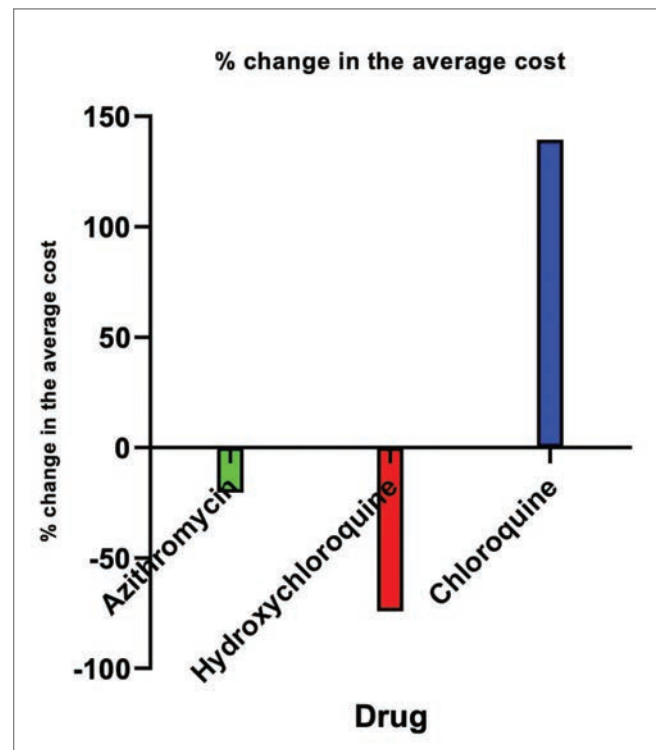


Figure 3. Percentage change in the average cost of each drug from 2016 to 2020 in Medicaid

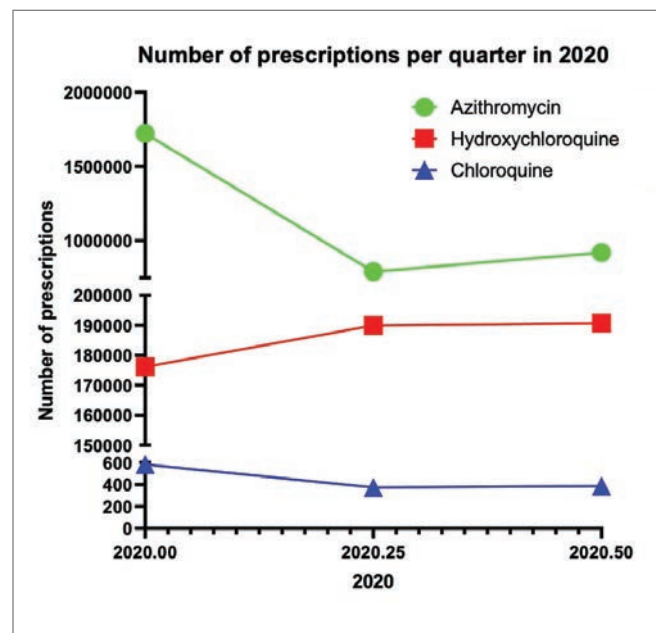


Figure 4. Number of prescriptions for first three quarters in 2020

Discussion

The decrease in azithromycin prescriptions from 2016 to 2020 can be linked to emergence of new antibiotics with stronger function and rapid emergence of resistant bacteria as well as increased antibiotic resistance crisis in the states (6). Studies have reported, but not confirmed, additional benefits of using these drugs with azithromycin (6). Hydroxychloroquine was briefly touted as a treatment, or prophylactic, for COVID-19 (7). Hydroxychloroquine was widely prescribed to patients who were hospitalized in the beginning of COVID-19 pandemic (1). The increase in the number of prescriptions for hydroxychloroquine from quarter 1 of 2020 to quarter 3 of 2020 can be secondary to the COVID-19 pandemic in states. The number of outpatients with prescription dispensed from retail pharmacies decreased substantially, likely related to transient interest in azithromycin in COVID-19 management in hospital settings (8). Although a later study showed that there were no significant differences in in-hospital mortality between patients who received hydroxychloroquine with or without azithromycin and patients who received neither drug (9).

Conclusion

During the early period of COVID-19 pandemic, there was an increase in prescription of hydroxychloroquine and decrease in the number of prescriptions for azithromycin and chloroquine. There are some limitations that need to be considered in interpreting the results of our study. First, the intrinsic disadvantages of web-based, online survey research include uncertainty over the validity of the data and sampling issues, as well as concerns surrounding the design, implementation, and evaluation of an online survey. Secondly, the Medicaid State Drug Utilization database updates frequently. The data from 2020 is still not up to date and hence limits our interpretation. Third, Medicaid only accounts for 20% of the population in states (10). We hope to further our research on the prescribing patterns of hydroxychloroquine, azithromycin, and chloroquine on a state-by-state basis to further assess the impacts of the COVID pandemic.

Acknowledgments

We would like to thank Brian Piper, PhD, Sonia Lobo, PhD, and Kimberly Miller, PharmD, for the professional guidance and feedback on this topic.

Disclosures

There is no financial relationship between this paper's authors and any institution mentioned herein.

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