Prescription watch analysis of pharmaceutical sales of otc formulation in post covid 19 lockdown period

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Abstract
Local pharmacies provide a unique vantage point for tracking pharmaceutical demand and supply. Reliable pharmacological infrastructure and distribution networks are necessary to contain the COVID-19 outbreak, which has mostly ravaged public health systems and livelihoods in resource-poor countries in sub-Saharan Africa. “The study's goal is to estimate how much the COVID-19 pandemic has affected the demand for medications administered in outpatient clinics. A retrospective, time-trend investigation of medicine sales, deficits, and research lab-confirmed COVID-19 cases was carried out from February 1, 2020, to April 30, 2020, and its corresponding period” (regarding sales alone). Six pharmaceuticals were investigated in great detail. In order to make the data comparable, a rescaling was performed using the min-max normalisation technique. Microsoft® Excel was used for all of the data analysis. Early on in the epidemic, there was a reported surge in demand for medications and a subsequent scarcity. On March 13th, 2020, only four days after the WHO proclaimed COVID-19 a pandemic, the highest percentage of sales was recorded. At the end of the month of March sales had already dipped to 2019 levels. By the conclusion of the research period, the percentage of medicine shortages had dropped below pre-COVID-19 levels, when they had peaked at about one week following the sales peak. Drugs with the greatest growth rates in sales and shortages were analysed; they included paracetamol, vitamin C, dapagliflozin plus metformin, a drug called plus ezetimibe, formoterol, et hydroxychloroquine. The sales and scarcity patterns of hydroxychloroquine were the most erratic of all the drugs studied.

Keywords: COVID-19, Pharmaceutical sector, medications, data analysis, paracetamol

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Introduction:
The outbreak of COVID-19 was first declared an emergency in public health of worldwide concern by the World Health Organisation (WHO) on January 30, 2020, and later on March 11, 2020, it was deemed a global pandemic. Nearly 5 million cases of coronavirus illness had been recorded by May 19 from 216 nations, regions, or territories. The epidemic curve has been flattened thanks to the use of preventative measures, which has kept healthcare demand from skyrocketing. Concerns about the continuous availability of medications for all individuals go hand in hand with the need to assure the provision of crucial medical and personal safety gear to combat the illness.

While there have been no reports of significant delays in pharmaceutical availability, the already-present problem of drug shortages may worsen as a result of the global state of a public health emergency. Countries' abilities to guarantee patients' access to pharmaceutical medicines may be impacted by anticipated limits in the production process (for example, closure of plants owing to quarantine) and interruptions in the supply chain. Furthermore, it is well-documented that people's habits shift in the midst of a pandemic. Restriction may cause panic, medical supply stockpiling, and even unrest. As a consequence, there will likely be a greater need for medications, which might exacerbate the problem of drug shortages, which are well recognised as having a detrimental effect on population welfare by increasing the strain on healthcare resources and heightening the risk of illness and death.

Using Google® Forms as the survey platform, an online survey was created for respondents to fill out and submit. This was done using a series of open-ended questions. Individuals with relevant expertise in the pharmaceutical industry were identified using a snowball referral mechanism. When saturation was achieved, we stopped recruiting new participants.

There were six free-form questions in the interview guide that was published on the Guggulu Form.
1. Describe how the COVID-19 epidemic impacted your everyday life, including your interactions with family and friends.
2. To see whether there was a change in sales volume before and after a lockdown, researchers paid special attention to lockdown times.
3. Describe the good and bad ways in which you've dealt with patients or customers throughout the epidemic.
4. If pharmaceutical companies improved their staffing and logistics, they may be better prepared for future pandemics.
5. Were there more product shortages following the outbreak of the COVID-19 pandemic than there had been previously?
6. How satisfied customers were with typical delivery times before and during the epidemic, and how those numbers have changed, etc.

In this document, "medicine shortages" refers to the unfilled pharmacy
medication orders from wholesale wholesalers.

**Taking Perspective of the Pandemic Drugs**

On March 2nd, 2020, the first cases of SARS-CoV-2 infection were reported in Portugal. Sales of medicines in 2020 have followed a similar trend to those seen in the prior year up to the conclusion of this week. Sales of antiviral medications, however, began to rise after March 9th, when the WHO designated COVID-19 a pandemic. The sales high occurred on March 13 (+60% week over week), therefore this pattern continued for a while. The first fatality was reported in Portugal on March 16th, and by 2020 drug sales were already on the decline. Since March 22nd, sales have levelled out and are on track to surpass 2019’s, while being somewhat lower than in 2018. During the course of the investigation, the number of newly verified cases increased exponentially before levelling off and then decreasing.

Sales and shortages of medicines in 2020 followed similar patterns until the discovery of the first COVID-19 cases throughout Portugal, with the normalised sales percentage being somewhat higher than the normalised shortages proportion (February 1st to March 8th). These shifts began on March 9th, with the share of shortages peaking (+62% over the previous week) around a week after sales peaked. The rate of new SARS-CoV-2 infections was also rising at this time. One and a half months after the outbreak and the first round of nationwide State of emergency announcements, at the end of April, the share of total pharmaceutical sales and shortages had fallen below levels reported before the COVID-19 outbreak.

Certain trends emerge about these pharmaceuticals. Similar tendencies were seen with paracetamol and ascorbic acid. When compared to the very first week of data gathering, the increase in supply was enormous. The week in which the WHO designated COVID-19 a pandemic had the highest percentage of sales for these medications relative to the entire market. While ascorbic acid shortages have not restored to pre-March levels, both sales and availability have improved since then. Similar patterns of sales and shortages were seen for the combination of dapagliflozin and metformin, formoterol, and rosuvastatin and ezetimibe, all of which are used to treat chronic diseases. The first and second weeks of March had the largest percentage of sales, while the third week saw the highest scarcity values. Since then, the ratio of shortages to sales has dropped and returned to pre-COVID-19 levels.

Hydroxychloroquine's pattern is the most distinct among the six INNs, with a high percentage of sales recorded for the longest time span and a peak in the final week of March. Concerning scarcities, a rise is shown between March 9 and March 25, when the highest value is recorded. In April, we saw a little decline in these rates, but we still aren’t back to the verified levels we were at before the COVID-19 epidemic.

**Global Spread and Treatment Regimen**

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1. Because of the surge in demand and the depletion of pharmacies' safety stockpiles, there was a rise in the number of orders placed;
2. Covid-19 limitations or not, a breakdown in the supply chain, or
3. Drugs are being prorated by wholesalers to ensure that everyone has access to life-saving medications that are either in limited supply or at risk of running out in the near future.

The government and the Spanish National Agency of Medicines and Health Products (INFARMED) worked with the European Commission to reduce the probability of medicine shortages during the COVID-19 outbreak via supplier initiatives and coordination. Pre-approval is now required
for the export or dispensing of pharmaceuticals from the strategic national stockpile to other member nations. Problems with exports and parallel commerce between EU members have been connected to shortages in cheaper countries like Portugal. According to available information, the current state of drug availability seems to be steady. Some producers, however, seem to be having trouble maintaining reliable production and/or distribution in the Portuguese market. For instance, manufacturers of paracetamol, rosuvastatin with ezetimibe, and formoterol have all notified the Portuguese Ministry of Health of a temporary shortage of their products beginning in January 2020.

It is crucial to address current medicine shortages. When utilised properly, medicines are a very beneficial kind of technology. The higher mortality form all causes compared to the same timeframe, especially among the elderly, is concerning, as is the evidence of inadequate use of healthcare due to COVID-19.

**Information Inputs on Six Pharmaceutical Substances**

The fact that paracetamol is used to treat a high temperature, one of the most prevalent symptoms of COVID-19, may explain why demand for the drug spiked soon after the announcement of the initial confirmed confirmed case in Portugal. The media’s focus on vitamin C’s potential as a preventative strategy due to its influence on immune system strengthening has also led to a rise in demand for oral forms of OTC ascorbic acid. Although a recent randomised controlled trial (RCT) done in the United States on patients with sepsis connected to acute lung damage suggests that a substantial daily intra vein dosage (15 g/day) of vitamin C taken for 4 days may decrease mortality, there is no proof that vitamins C may reduce COVID-19. It seems that there is still a substantial shortage of items despite the fact that sales are back to normal levels.

The spike in demand for formoterol, a medication used to treat severe cases of asthma and persistent pulmonary obstructive disorder, is consistent with the spread of the virus. Sales trends for the lipid-lowering medicine combination rosuvastatin and ezetimibe, which is used to treat individuals at elevated risk for cardiovascular disease, and the antidiabetic drug combination dapagliflozin and metformin are very comparable. Both drugs are very new to the Portuguese marketplace (2018 and 2016, respectively) and extremely costly, with few suitable treatment alternatives. Since chronic patients have a higher chance of more severe clinical consequences if they get the coronavirus, this may explain the growing demand for these treatments.

Since shortages of name-brand medications have been a persistent issue over the past several years, it's probable that some patients have already encountered supply problems. Formoterol and dapagliflozin with metformin continue to have significant rates of shortages, which might point to a longer-term undersupply problem that could limit patient access to these medicines. Although hydroxychloroquine has shown some efficiency in treating COVID-19, there is presently no known effective...
therapy or vaccination against the virus. Although the medicine showed promise in clinical studies, EMA advised that it be used only in accordance with national procedures. Medical prescriptions for and sales of hydroxychloroquine for the treatment of coronavirus pneumonia increased by a factor of 3. About two months after the first reported cases in Portugal, pharmacists still seem to be having trouble meeting demand for hydroxychloroquine. Off-label usage of this medication and its lack of availability on the market may have a negative effect on patients since it is used to treat rheumatoid arthritis, lupus, and as an antimalarial agent. There are no significant supply problems at this time. We don't know how long this epidemic will last, so it's important to keep an eye on it. This is particularly true given Europe's troubled past with pharmaceutical shortages.

Limitations
Because medicine shortages are dependent on the chemists' direct report, it is crucial to keep in that drugstores operate under extremely limited circumstances during this time (for example, reduced teams) as well as may not report everything of their unhappy orders, i.e., the registry may be impacted from underreporting. According to the data, medicine sales and shortages were about the same as they had been in the initial week in March, before the COVID-19 epidemic.

Conclusions
To better respond to public health emergencies like the one caused by the COVID-19 virus, national as well as European regulatory as well as policy entities can use the timely and real-world inpatient market data provided by pharmacies to propose guidelines for the preventive management of medicines. It seems from the data that the COVID-19 shutdown in Portugal had an effect on the sales and shortages of pharmaceuticals, but that the market has now been stabilised thanks to the steps adopted. We need to keep an eye out for any potential long-term consequences of this epidemic.

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