Immunotherapies and COVID-19 mortality: a multidisciplinary open data analysis based on FDA’s Adverse Event Reporting System

During the COVID-19 pandemic, the risks and potential benefits of immunotherapies for the treatment of autoimmune disorders are still not well defined, and many cohort studies neither took the epidemiological dynamics of COVID-19 nor the potential capacities of the local healthcare systems in their outcome analysis into account. Due to a pronounced heterogeneity in the outcome reports of different participating countries, the large ‘COVID-19 Global Rheumatology Alliance registry’ addressed this issue using a ‘cluster design’ and shed light on factors associated with a more severe COVID-19 course in their study population.1 We here present data of the US Food and Drug Administration (FDA) Adverse Event Reporting System (FAERS),2 a postmarketing, self-reporting, open-access pharmacovigilance platform that contains international data of COVID-19 cases. Sources of FAERS are voluntary reports from healthcare professionals and consumers. We combine this data set with local measurements of the course of the pandemic (from Oxford University’s ‘Our World in Data’3) and the potential resilience of the respective healthcare systems (from ‘World Bank’; see online supplemental table 1 for full source information).

Only patients with the diagnosis of an autoimmune disorder and a single immunotherapy (required group size: n≥100) at the time point of COVID-19 were analysed by multivariable regression analysis (online supplemental figure 1), limiting the generalisability of our data, for example, concerning combination therapy scenarios (online supplemental figure 1).

The mean age of patients in our cohort (n=2103) was 51.3 years (range 3–92 years; SD 14.9), female sex was more prevalent (1372/2103, 65.2%) and the majority of cases was reported in the USA/Canada (1285/2103, 61.1%). Inflammatory joint disease (846/2103, 40.2%), multiple sclerosis (474/2103, 22.5%) and inflammatory skin disease (435/2103, 20.7%) were the most prevalent diagnoses. Anti-tumour necrosis factor α (TNFα) therapies were the most frequently used medications for the underlying autoimmune disease (714/2103, 34%), followed by anti-CD20 therapies (388/2103, 18.4%). Additional cohort characteristics are shown in online supplemental table 1 and the monthly distribution of cases and cases by country in online supplemental figure 2.

In all, 26.3% of the reported patients were hospitalised (553/2103), and the overall reported mortality rate in our cohort was 5.1% (107/2103; for other outcomes, see online supplemental table 3). In the multivariable logistic regression analysis, age (OR per year 1.1; 95% CI 1.07 to 1.1; p<0.001) and female sex (OR 0.6; 95% CI 0.4 to 0.9; p=0.02) were significant predictors of mortality. Regarding immunotherapies, patients...
under anti-CD20 therapies had an increased mortality (OR 4.5; 95% CI 2.6 to 7.9; p=0.001), whereas those under anti-IL17 therapies had a reduced mortality (OR 0.2; 95% CI 0.04 to 0.67; p=0.01) compared with anti-TNFα therapies (reference group; figure 1).

In summary, using international open data sets and adjusting for local infectious diseases dynamics and the potential resilience of the national healthcare systems, our study demonstrates that anti-CD20 therapies are associated with a higher COVID-19 mortality risk in people with autoimmune disorders. This finding is in line with other cohort studies.1,4 Regarding the potential protective capacities of anti-IL17 treatments, further studies are needed. This study also identified age and male sex as relevant predictors of COVID-19-associated mortality, which should therefore be taken into account in individual risk–benefit assessments. Our study has several limitations, for example, the fact that FAERS reports basic information on patients. We could not analyse disease-specific characteristics, comorbidities and risk factors, which have previously shown to influence mortality risks, thus representing a limitation of our analysis. Furthermore, adjustment for individual disease groups was not possible due to multicollinearity to immunotherapies. Biological therapies and recently approved oral immunotherapies are over-represented compared with classical immunotherapies, pointing towards a selection bias of FAERS. Furthermore, we cannot report the method of SARS-CoV-2 detection, as this information is not included in the FAERS data set.

Finally, we consider the use of combined open-access, pharmacoepidemiological data and a multidisciplinary approach, despite its limitations, as a valuable tool to address the various issues posed by the SARS-CoV-2 pandemic. Our findings might represent a complement to already published data and call for intensified investigations within larger cohort and translational studies.

Maximilian Pistor 1,2, Andreas G F Hoeprner,2 Yanan Lin,2 Simon Jung,1 Claudio L Bassetti,1 Andrew Chan,1 Anke Salmen,1 Robert Hoeprner1
1Department of Neurology, Inselspital, Bern University Hospital, University of Bern, Bern, Switzerland
2Michael Smurfit Graduate Business School—Department of Banking & Finance, University College Dublin, Dublin, Ireland
3Platform for Sustainable Finance—Department for Financial Stability and Capital Markets (DG FISMA), European Commission, Brussels, Belgium

Correspondence to Dr Robert Hoeprner, Department of Neurology, Inselspital University Hospital Bern, Bern 3021, Switzerland; robert.hoeprner@insel.ch

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Contributors RH, MP AGFH, YL and AS were involved in study design. MP, RH, AGFH and YL were involved in data analysis. RH, MP, AGFH, YL, AS, SJ, AC and CB were involved in data Interpretation, data review and manuscript preparation.

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ORCID iD Maximilian Pistor http://orcid.org/0000-0002-7073-9974

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