

PEDIAPOD JULY 2023 TRANSCRIPT

Geoff Marsh

Hello and welcome to PEDIAPOD for July 2023. This month, we look at fetal and neonatal outcomes during the COVID-19 pandemic.

The COVID-19 pandemic severely affected health and healthcare systems worldwide and could have resulted in changes in fetal and neonatal outcomes.

Whilst there is some evidence that the pandemic led to worse pregnancy-related outcomes, only a few population-based studies have compared the risk of fetal and neonatal mortality in the pandemic period to the baseline period.

In this episode, we speak to Early Career Investigator, Vivek Shukla from the University of Alabama at Birmingham. Using machine learning techniques, he performed a population-based perinatal study to identify changes in fetal and neonatal outcomes during the initial and delta COVID-19 pandemic periods as compared to the baseline period.

Vivek Shukla

I am an assistant professor at the University of Alabama at Birmingham, in the department of pediatrics. I am a clinician-scientist with a focus on developing AI-based decision support tools. So that's my research interest.

Geoff Marsh

And where did you grow up?

Vivek Shukla

I grew up in Ahmedabad, a city in India. I grew up watching my dad who's also a pediatrician. So I was very inspired since I was a kid. And then I did my medical school and pediatric residency from Sardar Patel University in India, followed by fellowships in neonatology from the Indian Academy of Pediatrics in India and then the University of Toronto in Canada. Then as I went ahead in my career in Toronto I started getting more interested in machine learning and AI. Then I decided to come to the US and did my pediatric residency in SUNY, Downstate Health Sciences University, followed by a neonatology fellowship again at UAB. Recently, for the last year and a half I have started doing my PhD training in the Department of Electrical and Computer Engineering at UAB, focusing on the application of AI and machine learning in medicine. So far, I have focused on large database studies. The study that was recently published in Pediatric Research was also a large database study using the Alabama Department of Public Health database.

Geoff Marsh

So it sounds like you're well into these big population-based studies with a focus on AI. The paper we're here to talk about today was a huge population-based study based in Alabama

looking at the effects of the COVID 19 pandemic on fetal and neonatal outcomes. Tell me about that.

Vivek Shukla

There have been several studies looking at how mortality and how different outcomes have changed in the COVID-19 pandemic period. Most studies so far have been single center or not population-based studies. There are population-based studies as well but those have had very small study periods. The benefit of this study was we had a big large database, a population-based database so it will reflect population-based outcomes.

Geoff Marsh

Is there any evidence that the pandemic did have an effect on fetal and neonatal outcomes or was it just something you wanted to investigate?

Vivek Shukla

The COVID-19 pandemic was associated with several changes in healthcare delivery, healthcare utilization and different outcomes. So we were expecting to see some changes. Most of the studies have had varied results because they have not used large databases. The hypothesis we wanted to test is that the COVID-19 pandemic is associated with higher stillbirth but lower neonatal mortality rates. And the reason for choosing this hypothesis is that due to the changes in healthcare availability and healthcare utilization, there would be a higher percentage of pregnancies not getting the optimal care which might result in higher stillbirth. But the pregnancies who are at highest risk of mortality, neonatal mortality, would be ending up as stillbirth so it would paradoxically reduce the neonatal mortality rate. And the other consideration was that likely with hand washing and social distancing the rates of infection might have gone down and that might also contribute towards lower neonatal mortality.

Geoff Marsh

I get it. Rather than the virus itself affecting fetuses and pregnant individuals directly, it was more about disruption to that antenatal care that we know is associated with better outcomes.

Vivek Shukla

Yeh. In a population based study you can find out how outcomes have changed, you can adjust for what was changing and you can get the real impact of any health emergency or pandemic situation. So that was the benefit with the database that we had, that we could do that analysis.

Geoff Marsh

How did you aim to set up a study that would more robustly probe this association between neonatal and fetal mortality and the pandemic?

Vivek Shukla

Our study duration was basically encompassing the baseline period starting from 2016 to just before the start of the pandemic which was February 2020. And then we had the data for the initial pandemic period which we defined as March 2020, to June of 2021. And then we had the different delta pandemic period which happened around July of 2021. So that period was taken as the delta pandemic period from July 2021 to September 2021.

Geoff Marsh

And you looked at over 325,000 deliveries during that period?

Vivek Shukla

Yeah, so this database is basically a public health database from the Alabama Department of Public Health. It includes stillbirth and births and infant death records. So in this paper we used an ARIMA model, which is a type of machine learning model to prognosticate what would be the likely expected stillbirth and neonatal mortality rate.

Geoff Marsh

So when you looked at this huge data set what did you see happening to stillbirths and neonatal mortality before, compared to during, the COVID 19 pandemic? What effect did it have?

Vivek Shukla

We found that the neonatal mortality rate was going down during the pandemic period, both the initial and the delta pandemic period. Likewise, the stillbirth rate was also lower in both pandemic periods.

Geoff Marsh

But that was not what you'd hypothesized about the stillbirth?

Vivek Shukla

Yes, we found both stillbirth and neonatal mortality rates going down. Stillbirth was not statistically significant but the neonatal mortality rate reduction was statistically significant. Overall, there was a trend of decreasing neonatal mortality over the years. Then we did an ARIMA model adjusted analysis, which basically stands for 'autoregressive integrated moving average'. And what it basically does is takes into account what is happening in the past to kind of make predictions for the future. And we did not find any significant change in either the stillbirth or the neonatal mortality rate, meaning to say that when you adjust for what's going on in the baseline period, if there is a trend already happening in the baseline period, when we adjust for that there was no significant difference in either of those.

Geoff Marsh

Because just healthcare is improving, is that what you mean?

Vivek Shukla

Exactly. So anytime you have a long duration of population-based data, there would be some changes happening gradually over the period, irrespective of the pandemic. So there might already be some changes happening and when you adjust for those changes, it might be related to improvement in the care overall that is being delivered, there might be improved access to healthcare, there might be new interventions that are improving healthcare and stuff like that.

Geoff Marsh

If your model is to be believed, that the increases in neonatal mortality weren't really down to any pandemic factors but just the steady beat of improvement, what can we learn from this about preparedness for a future pandemic in terms of fetal and neonatal mortality? Are we saying that isn't something we really need to worry about in the next pandemic?

Vivek Shukla

Good question, Geoff. The initial thought was that there would be a significant increase in stillbirths and that likely would be a reflection of the care being provided not being up to the mark or the antenatal care not getting delivered or not being accessed. And seeing the result, we didn't find any major ups or downs. So my conjecture would be that it's likely a reflection of how resilient the healthcare system is, how it was still able to manage good antenatal care, good delivery care and post-delivery care, so that we don't see an increase in the mortality rates. So it does not mean that the COVID-19 pandemic did not have an effect. We still have to be mindful in the next pandemic, if that happens, that we are aware the outcomes might get worse. And we need to be responsive and be mindful of analyzing it close to real time and seeing how the mortality and big adverse outcomes are doing population-wise. So that if there is any adverse effect of an ongoing pandemic we can public health-wise manage it better in real time.

Geoff Marsh

Based on what you said about the fact that the pandemic didn't have any effect was down to resilience, we can't expect health system resilience to be the same all over the world. Would you like to see this population-based method being replicated in other states and indeed other parts of the world?

Vivek Shukla

So likely different places have had the effect varyingly across the globe, I would say. It's incumbent on public health organizations and the governmental systems to kind of analyze that and to be prepared for the next pandemic and how to best manage the next pandemic because what has happened has happened, but how can we improve our preparedness for the next one that might come.