

Pandemics and prayer: The impact of cattle markets and animal sacrifices during the muslim Eid festival on COVID-19 transmission and public health

To the Editor

Globally, as of July 24, 2020, the World Health Organization has reported 15,257,287 confirmed cases of coronavirus disease 2019 (COVID-19), including 628,240 deaths.¹ The causative virus for this global pandemic; severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a Betacoronavirus, subgenus Sarbecovirus, which originated in bats and spread within humans following an amplification and/or recombination event in an unidentified mammalian host.² The highly contagious virus is spread by human-to-human transmission via droplets or direct contact.³ This pandemic has caused organized religion, along with adherence to age old traditions, to re-evaluate itself with respect to congregational gatherings, burial rites, pilgrimage and other established acts of worship.⁴

One such act of worship which needs to be urgently discussed in the context of COVID-19 is the annual *Eid-ul-Adha* festival celebrated by billions of Muslims worldwide. *Eid-ul-Adha* marks a sacred Islamic ritual of mass animal sacrifice according to Islamic principles. During this time domestic animals; including goats, sheep, cattle and camels, are transported en masse from rural to urban areas where they are placed in temporary animal holdings.⁵ The animal sacrifice is made per affording household; as such millions of animals are stored for slaughter; oftentimes in unregulated holdings, and health checks are not able to be enforced uniformly.⁵ Moreover, freelance/non-professional butchers meet the exponential demand for animal slaughter during this time.⁵ Following slaughter, uncooked animal meat is distributed in the community, and animal carcasses, including internal organs, and hides are disposed off within the community.

According to the Islamic Lunar Calendar, this year *Eid-ul-Adha* will be celebrated from 30th July to August 3, 2020 (subject to sighting of the moon).⁶ This comes at a time when many Muslim majority countries are stilling struggling with the public health crisis posed by COVID-19, with variable success in controlling the transmission of the virus. The threat posed by COVID-19 during *Eid-ul-Adha* is twofold. First, mass animal migrations and the fulfillment of religious rites by millions will risk an explosive surge in COVID-19 cases due to the ensuing congestion and social mixing within the context of Eid celebrations.

Second, our current epidemiologic and phylo-genetic evidence base clearly demonstrates that SARS-CoV-2 has uncertain zoonotic origins and host range, with the potential to spill into many potential animal hosts. SARS-CoV-2 infection is mediated via the viral Spike protein receptor binding domain binding to angiotensin I converting enzyme 2 (ACE-2) receptor, which is preserved in mammals, and is expressed on ciliated bronchial epithelial cells and type II pneumocytes.⁷ A structural analysis of ACE-2 receptor in vertebrates has shown artiodactyl mammals (which include domesticated cattle, sheep and goats) express ACE-2 receptors and were classified as medium score for binding to SARS-CoV-2 Spike protein. The authors posited that such animals have some risk of infection, and further investigation into the role of ruminant artiodactyls as reservoirs for SARS-CoV-2 is warranted.⁷ This finding has been reiterated in a comparative x-ray structural analysis of SARS-CoV-2 spike protein receptor binding domain to ACE-2 receptors in humans and putative intermediate hosts. The study showed that cattle and sheep contain only 2 amino

acid changes (Asp30Glu and Met82Thr), and that it is highly likely that the ACE-2 receptor from these species can serve as a SARS-CoV-2 receptor.⁸

To ascertain the evolutionary origins of the current COVID-19 pandemic, a structural reconstruction of the spike glycoproteins with subsequent alignment and comparison was performed by Dabravolski and Kavalionak.⁹ Their analysis identified a yak beta coronavirus strain YAK/HY24/CH/2017 as the closest match in the comparison of structural models of spike glycoproteins, thus proposing yaks as a potential intermediate host.⁹ Their findings were supported by a report on the ACE2-spike glycoprotein complexes, suggesting Bovidae as potential hosts.¹⁰ Given the exceptional genetic plasticity characterizing the coronavirus genome, the risk of viral reassortment and interspecies transmission has significant implications for the creation of additional animal reservoirs via reverse zoonotic transmission and further outbreaks in the community.²

It is therefore urged that public health officials and local governance in Muslim majority countries take note of the risks involved in this year's *Eid-ul-Adha* celebrations and formulate comprehensive public health policies. These policies must encompass controlled and regulated transport of sacrificial animals, with strict health checks of both the animals and personnel transporting them. This will require mobilizing medical and veterinary personnel as key players in the public health response. The challenges to be faced include an undefined clinical spectrum of COVID-19 infection in animals and the unfeasibility of routinely testing all livestock for SARS-CoV-2.¹¹ We may still mitigate the risks of surges in transmission by public outreach; encouraging households to arrange for slaughter of sacrificial animals in remote facilities, equipped with veterinary and disinfection facilities. This will undoubtedly require support from the religious clergy to endorse alternate sacrificial practices, contrary to established traditions. Ensuring healthy butchers handle meat and authorized waste management services dispose of the carcasses will be mandatory. Distribution of meat in communal settings must be discouraged, or at least mediated via designated authorities/channels. Changing established public perceptions and behavior will not be an easy task, but it is necessary if we are to effectively combat the ongoing pandemic and safeguard our communities, whilst responsibly honoring religious rites.

CONFLICT OF INTEREST

The authors declare no potential conflict of interest.

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