

Vitamin D Deficiencies in Bangladesh and its Effect on COVID-19: A Review

Samah Malik – Columbia University College of Dental Medicine, Class of 2025

Mentors: Sylvana Sinha, Esq and Dr. Kim Hekimian, PhD – Columbia University

Research Question: The focus of this study was to determine if the Bangladeshi population faces an increased risk in the ongoing COVID-19 pandemic due to widespread deficiencies in vitamin D and investigate if additional supplementation of vitamin D could improve current COVID-19 treatments.

BACKGROUND

Despite its tropical climate and close proximity to the equator, vitamin D deficiency is an epidemic in Bangladesh, with detrimental effects on its population.¹ Vitamin D is essential in many processes related to calcium homeostasis and bone metabolism.² In Bangladesh, malnutrition is often to blame for insufficient levels of the nutrient. Deficiencies of vitamin D can cause rickets in children, and osteoporosis in adults.¹ It can also impact the development of certain chronic conditions and infectious diseases.³ Recent studies have indicated that vitamin D levels can affect the severity of COVID-19 infections.⁴

DESCRIPTION OF ORGANIZATION

Founded in 2018, Praava is Bangladesh's fastest growing medical center, working to provide a new approach to healthcare that is convenient, affordable, and high-quality. Praava is a one-stop shop for many services, such as primary care, specialists, imaging and lab diagnostics, dental care, and an in-house pharmacy. Their patient-centric model of care features a flagship medical center in Dhaka as well as COVID-19 testing sites. Praava also offers several remote options for patients to receive in the comfort and safety of their homes, such as telehealth services, video consultations, and home health checks. For long-time patients or those with chronic conditions, Praava offers an annual membership plan which includes one annual health check, unlimited consultations, and discounted rates on diagnostics and pharmaceutical products.

ACKNOWLEDGEMENTS

I would like to thank the support of my funders, the Global and Population Health Research Fellowship and the Tamer Center for Social Enterprise for providing me with the resources to participate in this opportunity. I would also like to thank the team at Praava Health, specifically Sylvana Sinha and Dr. Zaheed Hussain for their guidance throughout this process. Finally, I would like to acknowledge the Program for Education in Global and Population Health team, Dr. Kim Hekimian, Tania Genel, and Sivanthy Vasanthan for all their constant support and assistance in this experience.

TABLES

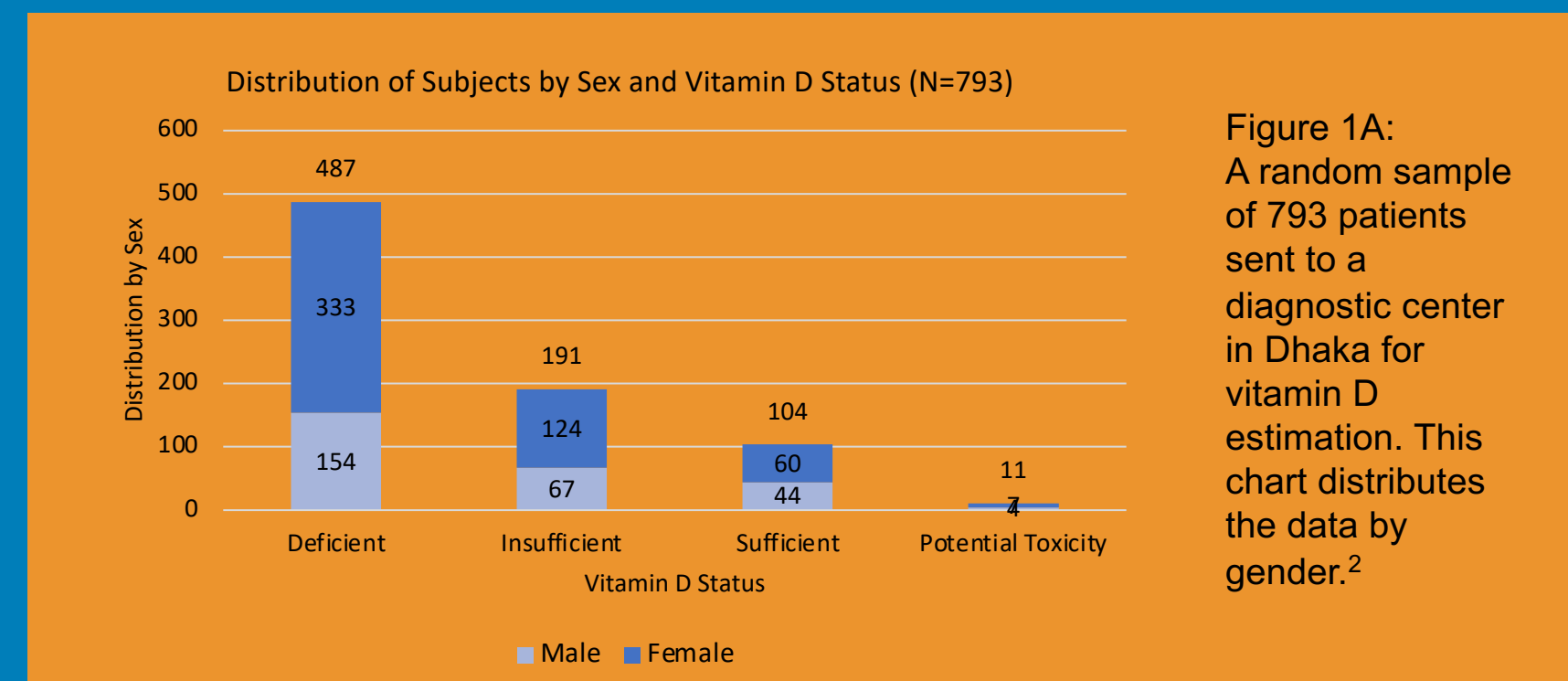


Figure 1A: A random sample of 793 patients sent to a diagnostic center in Dhaka for vitamin D estimation. This chart distributes the data by gender.²

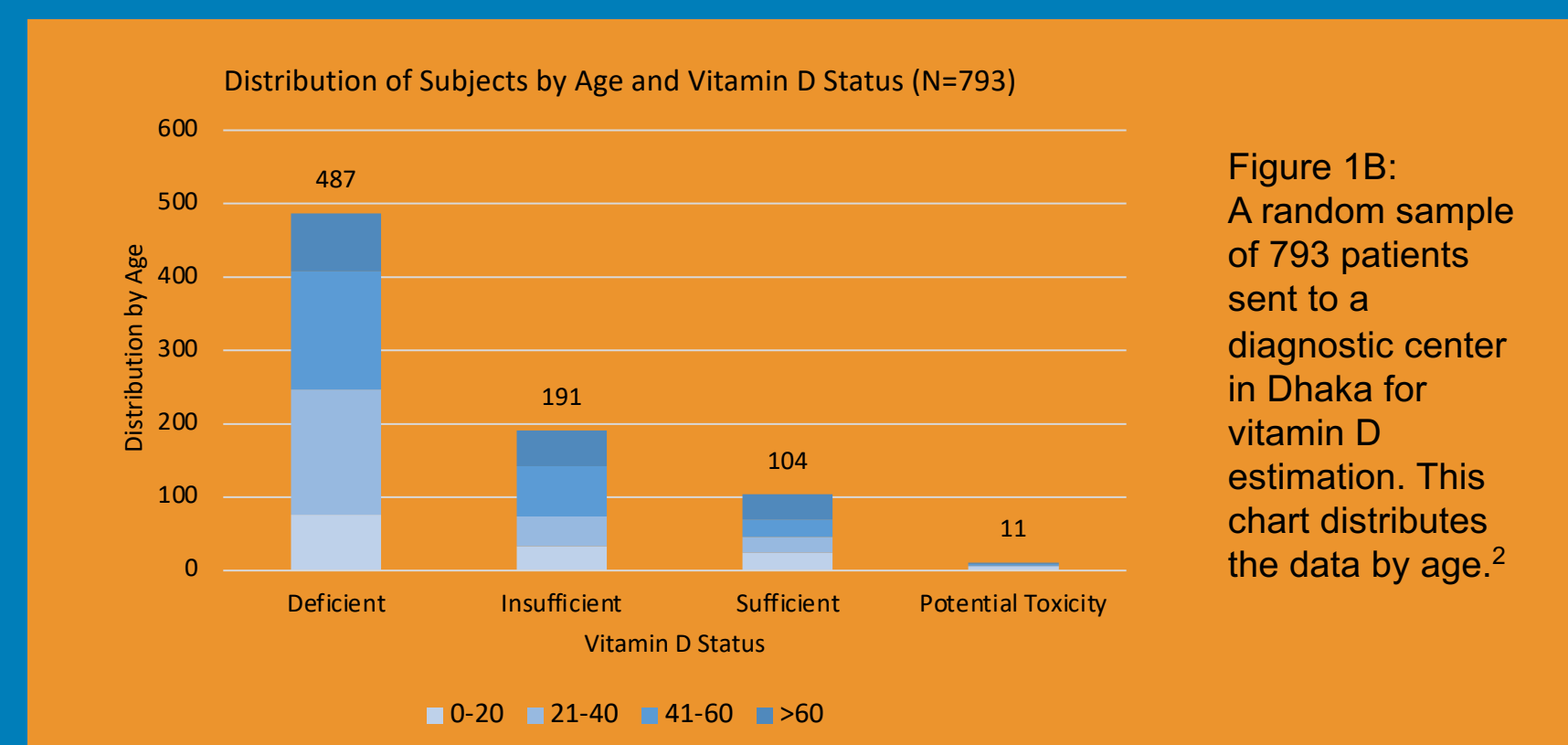


Figure 1B: A random sample of 793 patients sent to a diagnostic center in Dhaka for vitamin D estimation. This chart distributes the data by age.²

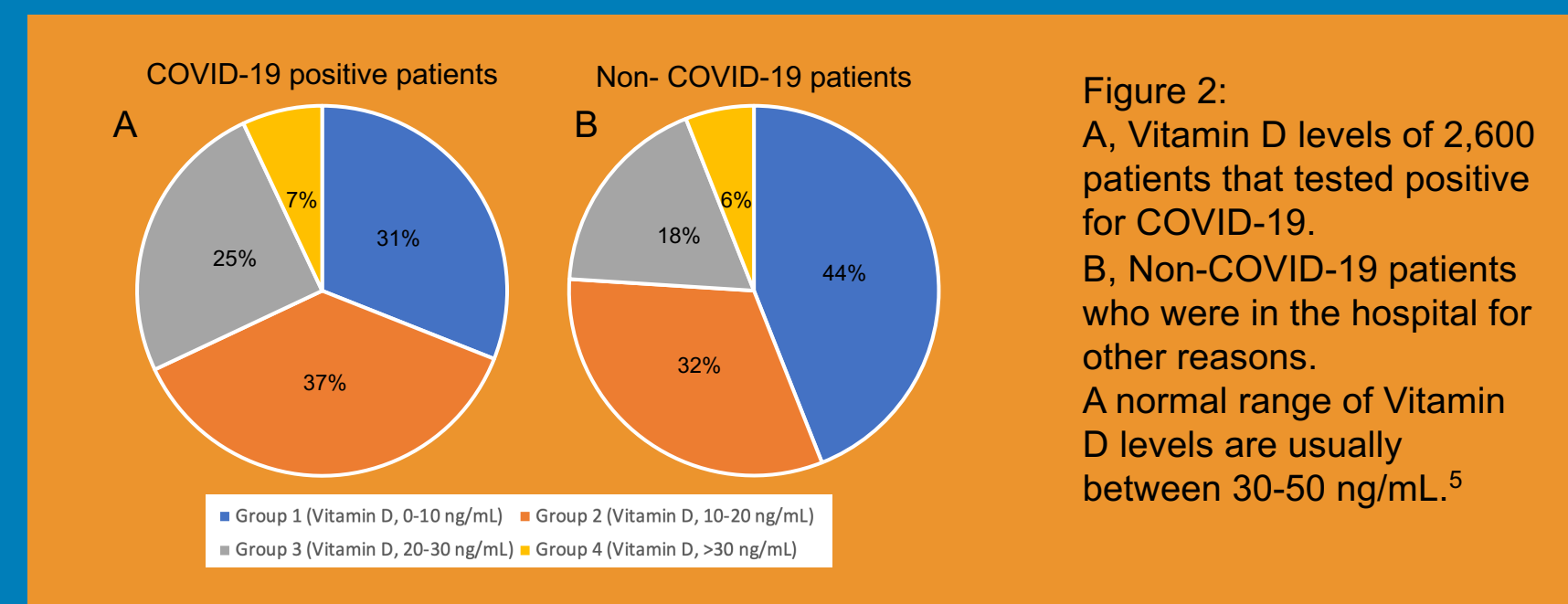


Figure 2: A, Vitamin D levels of 2,600 patients that tested positive for COVID-19. B, Non-COVID-19 patients who were in the hospital for other reasons. A normal range of Vitamin D levels are usually between 30-50 ng/mL.⁵

METHODS

For this review, online searches were conducted to find research pertaining to vitamin D deficiencies in Bangladesh. Searches were also conducted to find published research linking vitamin D levels and COVID-19. A variety of both qualitative and quantitative studies were utilized as sources for this review. Any articles that pertained to vitamin D deficiencies outside the scope of Bangladesh were excluded from the search.

- From the research gathered on vitamin D deficiencies in Bangladesh, the most at-risk groups suffering from this are women and children.³
- Deficiencies in vitamin D have been linked to an increase in severity in COVID-19 infections due to increases in underlying, nonspecific inflammation, as well as thrombotic episodes.⁴
- However, it is inconclusive if supplementation would aid all COVID-19 patients with a vitamin D deficiency.⁶

DISCUSSION

Based on current research, vitamin D deficient patients are at an increased risk of contracting a severe case of COVID-19. The severity of COVID-19 is often linked to the presence of other pre-existing conditions which lead to underlying inflammation. While the immune system plays a key role in eliminating COVID-19, uncontrolled inflammation and cytokine release can cause catastrophic injury to vital organs. Early intervention to prevent this could aid in reducing the severity of COVID-19 onset. A potential source of defense is found in T regulatory lymphocytes (Tregs). When found in high levels in blood, Tregs have been associated with a reduced level of viral respiratory disease. Treg numbers can be increased by vitamin D supplementation, suggesting a potential benefit in treating COVID-19.⁴ In another study conducted on Bangladeshi children hospitalized for severe pneumonia, also a viral respiratory infection, there are some contradictory findings. Admitted children with sufficient vitamin D levels benefitted from extra supplementation, as seen by a trend of reductions in recovery time as well as decreased hospital stays. However, dosing vitamin D did not have an impact on vitamin D deficient children and their clinical improvement from severe pneumonia. It is possible the coexistence of malnutrition may have impaired their immune response and blunted the impact of vitamin D supplementation.⁶ Further research would need to be conducted to determine the effects of malnutrition on this method of treatment.

REFERENCES

1. Dey, Moumita, and Shaikat Dey. "Calcium and Vitamin D Deficiency Situation in Bangladesh: A Review." *International Journal of Research and Reviews*, vol. 3, no. 9, 11 Sept. 2016.
2. Islam, AKM Monwarul, et al. "Vitamin D Status in Bangladeshi Subjects: A Laboratory Based Study." *BIRDEM Medical Journal*, vol. 9, no. 3, 2019, pp. 202-206. <https://doi.org/10.3329/birdem.v9i3.43081>.
3. Islam, Md Zahurul et al. "Vitamin D deficiency in Bangladesh: A review of prevalence, causes and recommendations for mitigation." *Asia Pacific journal of clinical nutrition* vol. 31,2 (2022): 167-180. doi:10.6133/apjcn.202206_31(2).0002
4. Weir, E Kenneth et al. "Does vitamin D deficiency increase the severity of COVID-19?" *Clinical medicine (London, England)* vol. 20,4 (2020): e107-e108. doi:10.7861/clinmed.2020-0301
5. Demir, Mustafa et al. "Vitamin D deficiency is associated with COVID-19 positivity and severity of the disease." *Journal of medical virology* vol. 93,5 (2021): 2992-2999. doi:10.1002/jmv.26832
6. Chowdhury, Fahmida, et al. "Vitamin D Supplementation among Bangladeshi Children under-Five Years of Age Hospitalised for Severe Pneumonia: A Randomised Placebo Controlled Trial." *PLOS ONE*, vol. 16, no. 2, 2021. <https://doi.org/10.1371/journal.pone.0246460>.

Contact Information

Email: sm5072@cumc.columbia.edu