

Diabetes mellitus emergence in Covid-19 Pandemic

Corona virus diseases 2019 (COVID-19) is a highly infectious pandemic viral disease that has spread the world in recent time associated with mark morbidity and mortality. This mortality and morbidity have been much more pronounced in those patient suffering from non-communicable disease among them diabetes mellitus is one of the commonest non communicable diseases associated with worsening clinical status in COVID -19 patients. Diabetes mellitus is a chronic metabolic disorder that currently affect about 422 million people worldwide.

COVID-19 and diabetes are both associated with reducing immunity causes acute and chronic disease process respectively. So both disease conditions can impact each other in terms of clinical progression and outcome. Chronic hyperglycemia is the main metabolic derangement in diabetes and give rise to glucotoxicity to body tissue with the formation of advanced glycation and product. These mechanism are responsible for the different complications of diabetes. Lipotoxicity also plays a role in diabetes related mortality and morbidity. Any stressful condition causes acute complications of both controlled and uncontrolled diabetic patients include diabetic ketoacidosis and hyperglycemic hyperosmolar states. Chronic hyperglycemia predisposes to infections and latter also worsen hyperglycemia that initiating a viscous cycle.

There is different study to evaluate receptor and pathogenic link between diabetes and COVID-19. The association between inflammation and diabetes was made based on the identification of inflammatory marker such as C-reactive protein, IL-6, plasminogen activator inhibitor -1, tumor necrosis factor α 1. Lepton and adiponectin 4,5. In COVID- 19 infection the inflammatory changes are initiated in the respiratory system with generation of multiple cytokine and chemokine factor. Inflammatory markers such as erythrocyte sedimentation rate, C- reactive protein and other marker were elevated in the serum of COVID-19 patients.

Roles of angiotensin-converting enzyme molecule and dipeptidyl peptidase were explored to show

their involment in COVID-19 and diabetes. Pathogenetic mechanism such as impaired immunity , microangiopathy and glycemic variability may explain the effect of diabetes on recovery of COVID-19 patients . incretins such as peptide and gastric inhibitory peptide are known to be defective in type-2 diabetes patients. They enhance insulin secretion. However these incretins can be degraded by Dipeptideyle peptidase4 (DPP-4) in the intestinal tract , thus potentially reducing their activities. DPP-4 inhibitor inhibit the activity of this degrading enzyme ,thus enhancing the capacity of incretins in insulin secretion. This same enzyme has been implicated as a component of an entry receptor for the coronavirus; human corona virus – Erasmus medical centre.

ACE2 receptor is very vital for SARS-COV-2 entry into the cells. The receptor is sufficiently expressed by epithelial cells of the lungs, intestine, kidney and vessels. Different investigations showed that the patients with diabetes also express high concentration of ACE2 and its level is significantly raised in those who taking angiotensin-converting enzyme inhibitors(ACEI) or angiotensin receptor blockers. Patients with diabetes mellitus have increased predisposition to viral and bacterial infection of the respiratory tract.

One of the mechanism responsible for this predisposition is the lazy leukocyte syndrome, which represents impaired leucocyte function of phagocytosis (impaired immunity). This further emphasizes the likelihood of increased propensity of SARS-COV-2 infections in diabetic patients.

There are respiratory changes on diabetic patient that affect lung volumes and pulmonary diffusing capacity Different study showed that in hyperglycemic states there is elevated glucose concentration in the respiratory epithelium which may affect its innate immune capacity. Hypoglycemia also increase cardiovascular mortality by accentuating Monocytes which are pro- inflammatory and enhancing platelet aggregation.

Covid-19 infection compounds the stress of diabetes mellitus by releasing glucocorticoids

and catecholamines into circulation. These worsen glycemic control and increase the formation of glycation end products in many organ and worsen prognosis.

Conclusion

The knowledge of interaction between diabetes mellitus and COVID-19 is still evaluating. However some clearly established links include the role of ACE2 and increased severity of COVID-19 infection in patient with diabetes. The role of DPP4 is implicated in MERS-COV pathogenesis. So diabetes and COVID-19 disease are producing a vicious cycle and increases morbidity and mortality. There is also need extensive research for incidence of diabetic patient after post pandemic Covid-19 world.

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Prof. Debabrata Banik

Department of Anaesthesia, Analgesia & Intensive Care Medicine, Bangabandhu Sheikh Mujib Medical University, Dhaka. Phone-01711544884, E-mail: banik85@bsmmu.edu.bd, banik85@gmail.com

Reference

1. Diabetes -world health organization (online) available from ; <https://WWW.Who.int/health.topics/diabetes>, (Accessed 2020 may 30)
2. Yang P , Feng J, Peng Q, Liux , Fan Z. Advanced glycation end products : potential mechanism and therapeutic target in cardiovascular complication under diabetes Oxid Med cell Longev.2019; Dec 6;2019:9570616.
3. Cary IM, Critchley JA, Dewilde S, Harris T, Hosking FJ, Cook DG. Risk to infection in type I and type II diabetes compared with the general population : a matched cohort study. Diabetes care 2018;41(3);513-21.
4. Duncan BB, Schmidt MI, Pankow JS, Ballantyne CM, Couper D, Vigo A et al. Low grade systemic inflammation and the development of type 2 Diabetes; The atherosclerosis risk in communities study diabetes 2003;52(7);1799-805.
5. Kengne AP , Batty GD, Hammer M. Stamatakis E , Czernichow S. Association of C-reactive with cardiovascular disease mortality according to diabetes status ; pooled analyses of 25,979 participant from four U.K prospective cohort studies Diabetes care, 2012;35:396-403.
6. FDA Drug safety communication :FDA warns that DPP-4 inhibitors for type-2 Diabetes may cause joint pain (online) Accessed 2020 May 20
7. Badawi A, Ryoo SG . Prevalence of diabetes in the 2009 influenza A (H1N1) and the Middle East respiratory syndrome corona virus ; a systematic review and meta analysis. J public Health Res 2016;5(3);733-9.
8. Fusco L , Pitocco D, Antonelli – In Calzi R Diabetic lung , an underrated complication from restrictive functional pattern to pulmonary hypertension . Diabetes Metab Res Rev 2019;35(6);3159.
9. Phillips BJ , Meguer JX , Redman J , Bakes EH. Factors determining the appearance of glucose in the upper and lower respiratory tract secretions . Intensive Care Medicine. 2003;29(12):2204-10
10. Iqbal A , Prince LR , Novodvorsky , Bernja KA , Thomas MR , Birch L , et al . Effect of hypoglycaemia on inflammatory responses and the response to low-dose endotoxemia in human . J Clin Endocrinol Metab . 2019;104(4);1187-95.
11. Van Cromphaut SJ. Hyper glycaemia as a part of the stress response: the underlying mechanisms, Best Pract Res Clin Anaesthesiol 2009;23(4);375-86.
12. Chidlere V, Ugweze, Basil, Chukwuma Ezeokpo et al. COVID-19 and Diabetes mellitus. The link and clinical complications- Dubai Diabetes Endocrinol J 2020-26-69-77 vol:-10.1159/000511354.