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Effect of covid-19 infection on levels of Thrombomodulin, Surfactant D proteins and some biochemical parameters.

Haitham Akram Sobhi[1], Aseel Mokdad Hatam Abdulwahed[2]

[1] Samarra university, College of applied sciences, Department of Pathological analysis , IRAQ

heatheem16@gmail.com

Unique: The review expected to decide the degrees of Thrombomodulin, Surfactant proteins D and various biochemical factors in men with Coronavirus Study bunches included 30 men with Coronavirus, 30 men who recuperated from Coronavirus, and 30 solid men as a benchmark group. Protein and organic chemistry measures include: Thrombomodulin, Surfactant proteins D, Glucose, Phosphorous, the outcomes were a critical (P ≥0.05) decline in the degrees of Thrombomodulin, Surfactant proteins D in Coronavirus patients contrasted with the benchmark group, while in the recuperating bunch, Thrombomodulin was low. Contrasted with the benchmark group, the Surfactant proteins D were higher in those recuperating from Coronavirus, while the degree of glucose and phosphorus was high in the gathering with Coronavirus, while the phosphorus was essentially lower at (P≥ 0.05) in the gathering of recuperated men contrasted with the benchmark group, While the Glucose was high in recuperating from Coronavirus.

Key words: COVID-19, Thrombomodulin, Surfactant proteinsD, ,Glucose, Phosphore.

Introduction

Covids are individuals from the family Coronaviridae and in the request Nidovirales (Li, 2016). They are infections in which the positive abandoned RNA has a measurement going from 60 to 140 nm with crown-like projections on its surface, giving it a crown-like appearance under an electron magnifying lens, subsequently the name (Richman et al., 2016).

Covids are separated into four gatherings: alpha infections, beta infections, gamma infections, and delta infections (Payne ., 2017 ؛Pal et al ., 2020). As per studies, SARS-CoV-2 is one of the types of the variety of beta Covid SARS-CoV-infection comprises of 2 of four underlying proteins, including nucleocapsid (N), spines (S), Memberne (M), envelope (E) and M protein (film) assume a crucial part in infection passage and envelope development (Kim et al.,2020) ,The E protein is liable for the duplication, coat development and viral spread (Schoeman and Handling 2019), and the expansion in infection record and gathering is the obligation of the multipurpose N protein (Kang et al., 2020). SARS-CoV-2 can be distinguished in different organs like the eyes, nasopharynx, spit, alveolar liquid, blood, digestion tracts and defecation after contamination (Li et al., 2020). The primary wellspring of transmission of disease (Falahi, and Kenarkoohi .,2020). The side effects of Coronavirus infection are queasiness or spewing, muscle or joint agony, sore throat, loss of smell or taste or

both, nasal blockage, fever, conjunctivitis, migraine, different sorts of skin rashes, the runs, chills, and tipsiness (Zhou et al., 2020).

SARS-CoV-2 can contaminate both the lower and upper aviation routes, making it more infectious and furthermore causing interior harm somewhere down in the lungs. SARS-CoV-2 might utilize the Angiotensin Convert-Catalyst 2 (ACE 2) receptor to enter cells in The human body ACE 2 proteins are fundamental for enzymatic capabilities that influence blood stream to the kidneys, heart, and lungs. Expert 2 receptors are plentiful on the outer layer of lung tissue and the Spike S proteins, conspicuous on the Coronavirus infection, assault these receptors to arrive at inside cells of the human body, controlling The cell, utilizing it to produce more infection, may diminish the enzymatic exhibition of the Pro 2 receptor itself, bringing about twofold harm to the lungs (Ni et al., 2020).

Fibrosis of lung tissue can prompt long haul breathing issues Covids like Serious Intense Respiratory Condition (SARS) and Center East Respiratory Disorder (MERS) ordinarily significantly affect the respiratory framework Scarring of lung tissue, called fibrosis, is one of the These impacts weaken the trading of oxygen and carbon dioxide in the lungs and the overall versatility of tissues (Colombo et al., 2020).

Pneumonia brought about by Coronavirus can prompt extreme breathing troubles and long haul harm to the air sacs in the lungs, and this is a significant issue as it might require a while to reestablish ordinary breathing, even after beginning recuperation from the illness, a concentrate by the Medical clinic Authority tracked down Hong Kong in Walk (2020) that the infection can cause misfortunes of up to 20-30% in the imperative limit of the lungs at times (South China Morning Post., 2020), and as Coronavirus pneumonia advances, the alveoli are loaded up with liquid that holes from veins in the lungs causing windedness, which prompts intense respiratory misery condition (ARDS) (Fan et al., 2020).

Surfactant protein D is a heterogeneous lipoprotein complex that covers the alveolar epithelium and balances out the lung by lessening surface strain in the alveoli (Johansson and Curstedt. , 1997; Hawgood. , 1997). This makes breathing more straightforward and forestalls alveolar edema. It additionally partakes in the pneumonic safeguard against breathed in microbes and poisons and manages the capability of endogenous respiratory cells (Wright, 2005).

Arroyo et al. proposed. , 2021 that the surfactant protein D ties the glycosylated Spike-S protein SARS-CoV-2 and prompts the arrangement of protein connecting, the basic step of viral gathering to work with its evacuation and forestall SARS-CoV SP-D. - CoV-2 reproduces in Caco-2 cells. In this way, SP-D perceives the SARS (S) protein to which it ties, starts accumulation and restrains viral replication in cells..

Thrombomodulin (TM) is a film glycoprotein that is communicated in endothelial cells (Lougheed and Bowman et al., 1995). TM in the body has two structures: the main structure has a higher sub-atomic weight and is bound to the cell film of endothelial cells, and the subsequent structure has a lower sub-atomic weight and addresses the dissolvable or plasma structure (Tomura et al., 1994). Goshua et al. 2020 saw that a particular marker of endothelial cell injury, dissolvable

thrombomodulin, corresponds with medical clinic release status and isolates endurance in patients with Coronavirus.

Phosphorous is a component that assumes a part in numerous natural cycles because of its capacity to move. It is likewise a fundamental component inside human cells that assumes a part in keeping up with the corrosive base equilibrium in the body, prompting the production of support frameworks in the blood and pee (KO et al., 2010; Abdulwahed, et al., 2020 ; Al-Samarraie et al.,2022).

Diabetes mellitus is a persistent illness described by outright or relative lack of insulin bringing about hyperglycemia coming about either in debilitated capability of pancreatic cells and therefore diminished insulin creation (T1DM). Type 1 diabetes mellitus or in the advancement of insulin obstruction and resulting loss of beta cell capability. (T2DM) type 2 diabetes mellitus (Rawshani, 2017; Lu, 2013).

Protein examination

The degrees of, Surfactant protein D , Thrombomodulin , in serum were estimated utilizing Peruser Elisa gadget fabricated by German organization Human.

Biochemical measure

Gauge the centralization of Phosphorous and Glucose in the blood serum utilizing the unit provided by BioLABo France (Tietzn w, 1999) Farrance,1987) ؛ Trinder,1969).

Statistical analysis

Values communicated as mean ± SD. information investigated done by utilizing and examination of fluctuation (ANOVA).

RESULTS AND DISCUSSION

The outcomes shows in Table 1 a huge lessening (P≥0.05) in, Thrombomodulin , Surfactant protein D, in men contrasted with control, while glucose and phosphorous shows critical increment at (P≥0.05) in men contrasted with control**.**

Table : Thrombomodulin and Surfactant protein D and Glucose and Phosphorous levels in patients in COVID -19 and control and follow –up .

Groups	Surfactant protein D	Thrombomodulin	Glucose	Phosphore
Control	18.5783±4.86 B	11.1347± 2.50 A	109.286±13.16 b	3.2143±0.61 B
Patient in COVID-19 group	11.1410 ± 2.91 C	4.3623±1.02 C	122.434±23.55 a	3.6713±0.69 A
Follow–up group	20.9633±3.69 A	9.2443±2.22 B	112.423±16.40 b	3.1000±0.69 b

Thrombomodulin focus diminished in Coronavirus subjects, as endothelial thrombomodulin articulation was essentially decreased by expanding safe cell penetration in the lungs of Coronavirus patients. Thrombomodulin assumes a mitigating part alongside its anticoagulant capability by hindering resistant cell attachment and stifling enactment of the supplement arrangement of cells in the lungs Coronavirus Conway 2012, Watanabe-Kusunoki et al. 2020, Crikis et al. 2010, Ito et

al. 2019. Won et al. that endothelial cell disability with expanded creation of procoagulant and diminished anticoagulant articulation relates with serious clump development and lung hypercoagulation during recuperation from Coronavirus patients, diminished thrombomodulin

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Surfactant D protein is diminished in individuals with Coronavirus as SARS-CoV-2 enters the respiratory lot and ties to the ACE2 receptor to enter type II alveolar cells. The capability of type II alveolar cells is to create surfactant, so adjuvant harm to these cells from the get-go throughout the infection could lessen pneumonic surfactant creation, and this might be the reason the centralization of SP-D that penetrates the cycle Fundamental hematopoiesis isn't high. Agustama et al. 2022 This is in concurrence with (Arroyo et al., 2021; Mustafa, et al.,2020). As brought up by Hori et al. In 2020, the low degree of SP-D might be because of taking steroid medication.Togashi et al. 2022 showed that SP-D creation from type II pneumocytes might be impacted by annihilation of type II pneumocytes followed by attack of SARS-CoV-2 in light of the fact that the degree of SP-D in serum in patients with Coronavirus pneumonia was exceptionally low.

Shao et al. 2020 refered to as the primary evaluation of cell injury after SARS-CoV contamination, and infection seriousness and demise are related with the provocative tempest brought about by SARS. As shown by examination of serum cytokine markers in 115 Coronavirus patients, harm to AT2 cells and lung structures stays Consistent fourteen days after SARS-CoV 2 leeway. This disease was more articulated in both moderate and extreme male patients than in female patients, and an expansion in serum levels of SPD was noted in the recuperated patients.

Hyperphosphatemia has happened with regards to Coronavirus, where studies have announced cases in which viral contamination is the reason for this hyperphosphatemia (Elkattawy et al., 2020; Tchidjou et al., 2020). Raised serum phosphorous is because of few instances of essential hypoparathyroidism brought about by SARS-CoV 2 disease and old essential hypoparathyroidism during Coronavirus contamination. Georgakopoulou et al. 2022. While in the recuperated from Coronavirus - 19 , the degree of phosphorous diminished.

Height of blood glucose level in people with Coronavirus and might be the aftereffect of intense pressure and cell storm disease, given the immediate impact of SARS-Co-V-2 infection on pancreatic cells and the proclivity of the skeletal SARS-CoV-2 protein toward the ACE2 receptor communicated in pancreatic cells and works with Its entrance prompts tissue harm and loss of the capacity to discharge insulin, which can prompt a fast decay in digestion prompting diabetic ketoacidosis. SARS-Co-2-V disease might make pancreatic cells breakdown, prompting the beginning of new diabetes in diabetic patients with prediabetes. disease with Coronavirus. Shifting levels of metabolic aggravation might happen in patients with Coronavirus because of resistant cell penetration, dead cell passing and SARS-CoV-2 viral disease of pancreatic beta cells Wu et al. 2021, Tang et al. 2021, Misra et al. 2021, Apicella et al. 2020, Li et al. , 2020, and concurs with the others 2021.

Coronavirus might influence glucose digestion, going from gentle to serious hyperglycemia regardless of ketoacidosis, reasons for hyperglycemia fundamentally owing to steroid treatment, cytokinesis and immune system harm to beta cells Misra et al. 2021.

Montefusco et al 2021 showed that patients who recuperated from Coronavirus had a glycemic list more prominent than 140 mg dL, and a higher mean postprandial glucose at 120 min, and our discoveries recommend that strange glycemic control happens in high glucose. The noticed hypoglycemia, insulin opposition, and beta-cell brokenness might be because of the favorable to incendiary climate started by the cell storm. This study shows that SARS-CoV-2 actuates insulin opposition and upsets legitimate beta-cell capability, possibly bringing about hyperglycemia. Clinically self-evident and noticeable even in the post-intense stage.

CONCLUSION

Coronavirus might be connected with decline levels of Thrombomodulin and Surfactant protein D, and increment levels of Glucose , Phosphore in the blood.

REFERENCE

Agustama,A, Veterini.A.S, Utariani,A . (2022).Correlation of Surfactant Protein D (SP-D) Serum Levels with ARDS Severity and Mortality in Covid-19 Patients in Indonesia. Acta Medica Academica;51(1):xx-xx DOI: 10.5644/ama2006-124.XX

Abdulwahed, A. M. H., Alkanaani, M. I., Alsamarrai, A. H., Hamad, M. A. M., Dakheel, A., & AL-Samarraie, M. Q. (2020). Determination of some visfatin hormone level and lipid profilein some breast cancer patients in Samarra city. Annals of Tropical Medicine and Public Health, 23, 265-267.

Al-Samarraie, M. Q., Mohammed, H. E., Noori, D. S., & Hassan, Z. M. (2022, November). Prevalence of vitamin D3 deficiency in people according age, weight and gender in Samarra city. In AIP Conference Proceedings (Vol. 2394, No. 1, p. 080007). AIP Publishing LLC.

Apicella, M., Campopiano, M. C., Mantuano, M., Mazoni, L., Coppelli, A., & Del Prato, S. (2020). COVID-19 in people with diabetes: understanding the reasons for worse outcomes. *The lancet Diabetes & endocrinology*, *8*(9), 782-792.

Arroyo, R., Grant, S. N., Colombo, M., Salvioni, L., Corsi, F., Truffi, M., ... & Kingma, P. S. (2021). Full-Length Recombinant hSP-D Binds and Inhibits SARS-CoV-2. *Biomolecules*, *11*(8), 1114.

Colombo, C., Burgel, P. R., Gartner, S., van Koningsbruggen-Rietschel, S., Naehrlich, L., Sermet-Gaudelus, I., & Southern, K. W. (2020). Impact of COVID-19 on people with cystic fibrosis. *The Lancet Respiratory Medicine*, *8*(5), e35-e36.

Conway, E. M**.** (2012, January). Thrombomodulin and its role in inflammation. In *Seminars in immunopathology* (Vol. 34, No. 1, pp. 107-125). Springer-Verlag..

Elkattawy, S., Alyacoub, R., Ayad, S., Pandya, M., & Eckman, A. (2020). A novel case of hypoparathyroidism secondary to SARS-CoV-2 infection. *Cureus*, *12*(8).

Falahi, S.; Kenarkoohi, A.(2020)Transmission routes for SARS-CoV-2 infection: Review of evidence. New Microbes New Infect., 38, 100 -778.

Fan, E., Beitler, J. R., Brochard, L., Calfee, C. S., Ferguson, N. D., Slutsky, A. S., & Brodie, D. (2020). COVID-19-associated acute respiratory distress syndrome: is a different approach to management warranted?. *The Lancet Respiratory Medicine*, *8*(8), 816-821.

Farrance I. Clin. Biochem. reviews (1987). 8. p.55 to 68.

Goshua, G., Pine, A. B., Meizlish, M. L., Chang, C. H., Zhang, H., Bahel, P., ... & Lee, A. I**.** (2020). Endotheliopathy in COVID-19-associated coagulopathy: evidence from a single-centre, cross-sectional study. *The Lancet Haematology*, *7*(8), e575-e582.

Georgakopoulou, V. E., Avramopoulos, P., Papalexis, P., Bitsani, A., Damaskos, C., Garmpi, A., ... & Spandidos, D. A. (2022). COVID-19 induced hypoparathyroidism: A case report. *Experimental and Therapeutic Medicine*, *23*(5), 1-5

Horii, H., Kamada, K., Nakakubo, S., Yamashita, Y., Nakamura, J., Nasuhara, Y., & Konno, S**.** (2020). Rapidly progressive organizing pneumonia associated with COVID-19. *Respiratory Medicine Case Reports*, *31*, 101295.

Ito, T., Thachil, J., Asakura, H., Levy, J. H., & Iba, T**.** (2019). Thrombomodulin in disseminated intravascular coagulation and other critical conditions—a multi-faceted anticoagulant protein with therapeutic potential. *Critical Care*, *23*(1), 1-11.

Johansson, J., & Curstedt, T. (1997). Molecular structures and interactions of pulmonary surfactant components. *European journal of biochemistry*, *244*(3), 675-693.

Kang, S., Yang, M., Hong, Z., Zhang, L., Huang, Z., Chen, X., ... & Chen, S. (2020). Crystal structure of SARS-CoV-2 nucleocapsid protein RNA binding domain reveals potential unique drug targeting sites. *Acta Pharmaceutica Sinica B*, *10*(7), 1228-1238.

Kim, D., Lee, J. Y., Yang, J. S., Kim, J. W., Kim, V. N., & Chang, H. (2020)**.** The architecture of SARS-CoV-2 transcriptome. *Cell*, *181*(4), 914-921.

KO, S., CO, O., & O, E. O. (2010). The importance of mineral elements for humans, domestic animals and plants-A review. *African journal of food science*, *4*(5), 200-222.

Li, F. (2016). Structure, function, and evolution of coronavirus spike proteins. *Annual review of virology*, *3*(1), 237.

Li, H., Wang, Y., Ji, M., Pei, F., Zhao, Q., Zhou, Y., ... & Wang, Y. (2020)**.** Transmission routes analysis of SARS-CoV-2: a systematic review and case report. *Frontiers in cell and developmental biology*, 618..

Li, J., Wang, X., Chen, J., Zuo, X., Zhang, H., & Deng, A**.** (2020). COVID-19 infection may cause ketosis and ketoacidosis. *Diabetes, Obesity and Metabolism*, *22*(10), 1935-1941.

Lougheed, J. C., Bowman, C. L., Meininger, D. P., & Komives, E. A. (1995). Thrombin inhibition by cyclic peptides from thrombomodulin. *Protein Science*, *4*(4), 773-780.

Lu J, Xie G, Jia W, et al.(2013). Metabolomics in human type 2 diabetes research. Frontiers in Medicine.;7:4-13.

Misra, A., Ghosh, A., & Gupta, R. (2021). Heterogeneity in presentation of hyperglycaemia during COVID-19 pandemic: a proposed classification. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, *15*(1), 403-406.

Nanditha, A., Raghavan, A., Misra, A., Saboo, B., Singh, A. K., Joshi, S. R., ... & Ramachandran, A. (2021). Management of hyperglycemia in COVID-19 and post-COVID-19 syndrome-proposed guidelines for India. *The Journal of the Association of Physicians of India*, *69*(9), 11-12.

Ni, W., Yang, X., Yang, D., Bao, J., Li, R., Xiao, Y., ... & Gao, Z**.** (2020). Role of angiotensin-converting enzyme 2 (ACE2) in COVID-19. *Critical Care*, *24*(1), 1-10.

Mustafa, M. A., AL-Samarraie, M. Q., & Ahmed, M. T. (2020). Molecular techniques of viral diagnosis. Science Archives, 1(3), 89-92.

Pal, M., Berhanu, G., Desalegn, C., & Kandi, V**.** (2020). Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2): an update. *Cureus*, *12*(3).

Pal, M., Berhanu, G., Desalegn, C., & Kandi, V**.** (2020). Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2): an update. *Cureus*, *12*(3).

Payne, S. (2017). *Family coronaviridae. Viruses. 2017: 149–158. doi: 10.1016*. B978-0-12-803109-4.00017-9.

Rawshani, A., Rawshani, A., Franzén, S., Eliasson, B., Svensson, A. M., Miftaraj, M., ... & Gudbjörnsdottir, S. (2017). Mortality and cardiovascular disease in type 1 and type 2 diabetes. *New England journal of medicine*, *376*(15), 1407-1418.

Richman, D. D., Whitley, R. J., & Hayden, F. G. (2016). Viral infections of the central nervous system. *Clinical virology: John Wiley & Sons*.

Schoeman, D., & Fielding, B. C**.** (2019). Coronavirus envelope protein: current knowledge. *Virology journal*, *16*(1), 1-22.

Shao, H., Qin, Z., Geng, B., Wu, J., Zhang, L., Zhang, Q., ... & Chen**, H. (2020).** Impaired lung regeneration after SARS-CoV-2 infection. *Cell proliferation*, *53*(12).

South China Morning Post. (March, 2020). South China Morning Post. https://www.scmp.com/news/hong-kong/health-environment/article/3074988/coronavirus-some-recovered-patients-may-have.

Tang, X., Uhl, S., Zhang, T., Xue, D., Li, B., Vandana, J. J., ... & Chen, S. (2021). SARS-CoV-2 infection induces beta cell transdifferentiation. *Cell metabolism*, *33*(8), 1577-1591.

Tchidjou, H. K., Caron, F., Ferec, A., Braun, K., Hery, L., Castelain, S., & Romeo, B. (2020). Severe hyperphosphatasemia and severe acute respiratory syndrome Coronavirus 2 infection in children. *Blood Coagulation & Fibrinolysis*, *31*(8), 575-577.

Tietz n.w. Text book of clinical chemistry, 3rd Ed. C.A. Burtis, E.R. Ashwood, W.B. Saunders (1999) p. 1406-1457.

Togashi, Y., Kono, Y., Okuma, T., Shioiri, N., Mizushima, R., Tanaka, A., ... & Abe, S. (2022). Surfactant protein D: A useful biomarker for distinguishing COVID-19 pneumonia from COVID-19 pneumonia-like diseases. *Health Science Reports*, *5*(3), e622.

Tomura, S., Deguchi, F., Marumo, F., & Aoki, N. (1994). Enhanced presence of thrombomodulin in the glomeruli of lupus glomerulonephritis. *Clinical nephrology*, *41*(4), 205-210.

Trinder P. Ann. Clin. Biochem. (1969), 6, p.27-29.

Watanabe-Kusunoki, K., Nakazawa, D., Ishizu, A., & Atsumi, T. (2020). Thrombomodulin as a physiological modulator of intravascular injury. *Frontiers in Immunology*, *11*, 575890.

Wright, J. R. (2005). Immunoregulatory functions of surfactant proteins. *Nature Reviews Immunology*, *5*(1), 58-68

Wu, C. T., Lidsky, P. V., Xiao, Y., Lee, I. T., Cheng, R., Nakayama, T., ... & Jackson, P. K**.** (2021). SARS-CoV-2 infects human pancreatic β cells and elicits β cell impairment. *Cell metabolism*, *33*(8), 1565-1576.

Won, T., Wood, M. K., Hughes, D. M., Talor, M. V., Ma, Z., Schneider, J., ... & Čiháková, D. (2022). Endothelial thrombomodulin downregulation caused by hypoxia contributes to severe infiltration and coagulopathy in COVID-19 patient lungs. *EBioMedicine*, *75*, 103812.

Zhou, P., Yang, X. L., Wang, X. G., Hu, B., Zhang, L., Zhang, W., ... & Shi, Z. L**.** (2020). A pneumonia outbreak associated with a new coronavirus of probable bat origin. *nature*, *579*(7798), 270-273.