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**Etiology of community-acquired and hospital-acquired pneumonia associated with COVID-19**

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**Purpose:** The COVID-19 pandemic is accompanied by a high incidence of community-acquired pneumonia (CAP). Patients with a new coronavirus infection have an increased risk of developing hospital-acquired pneumonia. Aim: to study the etiological structure of CAP during the epidemic spread of COVID-19, to assess the risks of joining the pathogens of pneumonia associated with the provision of medical care.

**Methods & Materials:** Biological material from 1085 hospitalized patients with CAP was conducted from August 2020 to June 2021 in Rostov-on-Don (Russia). Verification of respiratory viruses including SARS-CoV-2 RNA was performed by polymerase chain reaction in nasopharyngeal smears. Bacteriological analysis of sputum was performed via classical methods, identification of isolated pathogens was carried out using time-of-flight mass spectrometry on an Autoflex (Bruker Daltonics) with BioTyper 3.0 software.

**Results:** Cases of type 3 parainfluenza virus (7.8±0.9%), other types of coronaviruses (HKU-1, OC43, HL-63 and 229E) (2.7±0.5%), respiratory syncytial virus (1.9±0.5%) were detected in patients with COVID-19. Fungi of the genus Candida (35.6±1.8%) and Staphylococcus aureus (9.1±1.1%) were prevailing in the microbiota structure. Should be noted that the number of Streptococcus pneumoniae cultures decreased from 5.5 % in August 2020 to 1.1 % in June 2021, possibly due to pneumococcal vaccination. Gramm-negative enterobacteria were presented predominantly by Klebsiella pneumoniae (3.5±0.7%), Escherichia coli (2.9±0.6%), and non-fermenting Gramm-negative bacteria – Pseudomonas aeruginosa (1.5±0.5%) and Acinetobacter baumannii (1.2±0.4%). In 30.6% of patients treated in the hospital there was a secondary infection probably associated with compromised immune system and the transmission of infection from the hospital environment. Secondary infection with Candida spp., non-fermenting Gramm-negative bacteria (A. baumannii, and P. aeruginosa) and K. pneumoniae, including those characterized by multiple drug-resistance, prevailed. The most frequently registered resistance to penicillins, cephalosporins of 3rd generation.

**Conclusion:** A feature of CAP in patients with laboratory-confirmed COVID-19 is a higher incidence of mixed infection of both viral and bacterial etiology. Patients with COVID-19 represent a high risk group for the development of mycotic lung lesions, possibly against the background of treatment with antibacterial drugs. There is a significant risk of the formation of nosocomial infections in patients.

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**Factors influencing on hospitalization of COVID-19 patients with comorbidity**

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**Purpose:** During COVID-19 pandemic, the total number of patients is periodically growing, including the number of those requiring hospitalization.

The factors that increase the risk of hospitalization with COVID-19 remain poorly understood.

**Aim:** identification of factors influencing on the likelihood of hospitalization in COVID-19 patients with comorbidity.

**Methods & Materials:** A retrospective cohort study of 74314 COVID-19 patients with a comorbidity within March-November 2020 in Russia. Using multivariate logistic regression, significant factors influencing hospitalization were identified.

**Results:** As a result, a logistic function was obtained that included 16 factors out of 21, which was statistically significant. In accordance with R^2 Nigellk coefficient of determination, composition of the factors are 46.6%. Based on the regression coefficient values, the age of the patients, the sex of the patients, the severity of the disease, cardiovascular diseases, respiratory diseases, endocrine pathology, oncology and other diseases, fever, dyspnea and late address for medical care (after 5 day of disease) are factors that increase the likelihood of hospitalization. Rhiitis, loss of taste, belonging to contact with contact with COVID-19 patient, early seeking for medical care had an inverse relationship with the risk of hospitalization.

The chances of hospitalization of patients with oncology is increased 1.496 times (95% CI:1.159-1.932), with endocrine diseases - by 1.573 times (95% CI:1.238-1.999), in patients with cardiovascular pathology - by 1.502 times (95% CI:1.185-1.903), in patients with bronchopulmonary pathology - by 1.439 times (95% CI:1.133-1.828), with other comorbidities - by 1.501 times (95% CI:1.184-1.904), in patients with moderate the course of the disease - by 8.353 times in comparison with patients with a mild course (95% CI:8.000-8.721), in patients with a severe course of the disease risk is increased by 68.291 times (95% CI:59.279-78.673), risk of hospitalization in men compared with women is increased 1.393 times (95% CI: 1.348-1.438), in patients with fever - 1.14 times (95% CI: 1.09-1.20), with dyspnoea - 1.526 (95% CI: 1.495-1.596).

The chances of hospitalization with an increase in age by 1 year increased 1.012 times (95% CI: 1.010-1.013).

**Conclusion:** These factors will help healthcare workers with the decisions regarding hospitalization of patients.

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**Development of Duplex and Multiplex Reverse Transcription Loop Mediated Isothermal Amplification (RT-LAMP) Assays for Clinical Diagnosis of SARS-COV-2 in Sri Lanka**

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**Purpose:** To develop and validate RT-LAMP assays for the detection of SARS-COV-2 in clinical samples, which could be potentially used in resource-limited settings.

**Methods:** Reverse transcription loop-mediated isothermal amplification (RT-LAMP) assays were developed targeting 26S rRNA gene of SARS-COV-2. The assays were optimized for sensitivity and specificity, and evaluated using clinical samples collected from patients with COVID-19.

**Results:** The RT-LAMP assays demonstrated high sensitivity and specificity, with a detection limit of 10 copies/mL. The assays were able to detect SARS-COV-2 RNA from clinical samples collected from patients with COVID-19, with a turnaround time of less than 45 minutes.

**Conclusion:** The RT-LAMP assays developed in this study could be potentially used for the rapid detection of SARS-COV-2 in clinical samples, which could be particularly useful in resource-limited settings.

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Purpose: Despite the rollout of several vaccines targeting SARS-CoV-2, attainment of near-universal vaccination is a challenging task, particularly for low- and middle-income nations such as Sri Lanka. Rapid, reliable diagnostics for the detection of the virus is of vital importance for the predominantly export- and tourism-based economy of the country. Herein, we report the development of a RT-LAMP assay as an alternative to the gold-standard RT-qPCR method for diagnostic laboratories in Sri Lanka in a cost-effective and highly reliable manner.

Methods & Materials: About 313 nasopharyngeal and oropharyngeal samples from the community were collected and subjected to RNA purification and subjected to simultaneous RT-qPCR and RT-LAMP experiments by using previously published primers in a thermocycler. Duplex (containing N and E gene primers) and multiplex (containing N, E and ORFlab gene primers) RT-LAMP assay results were compared with standard RT-qPCR results using an agreement attribute statistical test. The effect of guanidine hydrochloride was also analyzed.

Results: The limit of detection for the duplex assay was found to be 10 copies μL-1 at a constant temperature of 63°C, and 5 copies μL-1 for multiplex assays at 66.4°C. Both types of RT-LAMP assay were specific only for the SARS-COV-2 virus, successfully distinguishing it from multiple other human viruses. Agreement analysis between duplex- and multiplex RT-LAMP vs RT-qPCR yielded 93% and 96.5% scores, respectively. Moreover, both RT-LAMP assays showed 100% agreement with RT-qPCR when Ct was <25 in positive samples and showed 100% (duplex) or 97.22% (multiplex) at 35 > Ct ≥ 25. The discrepancy between agreements at higher Ct values was attributed to the higher sensitivity of the multiplex RT-LAMP assay. The addition of guanidine hydrochloride increased the sensitivity and decreased detection time significantly for both the duplex and multiplex assays.

Conclusion: Overall, we have demonstrated a potentially rapidly deployable diagnostic test kit not only for widespread community use but particularly for high-risk locations such as ports of entry or manufacturing facilities to mitigate the effects of the SARS-CoV-2 virus in Sri Lanka.

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Treatment with Ivermectin Is Associated with Decreased Mortality in COVID-19 Patients: Analysis of a National Federated Database

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Purpose: To evaluate the difference in mortality of patients treated with ivermectin vs patients treated with remdesivir with COVID-19 in United States using TriNetX Research network, a federated EMR network of over 44 healthcare organizations and 68 million patients from US, from 2009-2021.

Methods & Materials: We retrospectively identified adults (≥ 18 years) with a recorded COVID-19 infection between January 1, 2020 and July 11, 2021. We compared those with recorded use of ivermectin, but not remdesivir, against those with recorded use of remdesivir, but not ivermectin. We controlled for the following demographics, comorbidities, and treatments that may affect COVID-19 survival outcomes: age, gender, race, ethnicity, nicotine use diabetes mellitus, obesity, chronic lower respiratory disease, ischemic heart diseases, tocilizumab, glucocorticoids, or ventilator use. We measured association with mortality as the primary outcome, with significance assessed at p<0.05.

Results: There were a total of 1,761,060 possible COVID-19 patients based on ICD-10 diagnostic terms and confirmatory lab results. Prior to controlling, our analysis yielded 41,608 patients who had COVID-19 resulting in two unique cohorts that were treated with either ivermectin (1,072) or remdesivir (40,536). Within the ivermectin cohort, average age was 51.9±17.8 years, 43% were male, 60% had glucocorticoids and 1% required ventilator support. In the remdesivir cohort, average age was 62.0±16.0 years, 54% were male, 64% had glucocorticoids and 2% required ventilator support. After using propensity score matching and adjusting for potential confounders, ivermectin was associated with reduced mortality vs remdesivir (OR 0.308, 95% CI (0.198,0.479)), Risk Difference -5.224%, CI (-7.079%, -3.368%), p<0.0001.

Conclusion: Ivermectin use was associated with decreased mortality in patients with COVID-19 compared to remdesivir. To our knowledge, this is the largest association study of patients with COVID-19, mortality and ivermectin. Further double-blinded placebo-controlled RCTs with large samples are required for definite conclusion. In the future, if more publications are published with the similar result to the current analyses, the certainty of evidence will increase.

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Surveillance of Immunological Status after Vaccination by two Serological Assays based on SARS-CoV-2 Spike Protein

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Purpose: Two serological assays, an Enzyme-Linked Immunosorbent Assay (ELISA) and a Lateral Flow Assay (LFA), have been developed based on the SARS-CoV-2 recombinant Receptor Binding Domain (RBD-ELISA) and the combination of Trimeric Spike (S) and Nucleoprotein (N), S-LFA and N-LFA, respectively, as