



COVID-19: Making sense of the literature

Respiratory virus shedding in exhaled breath and efficacy of surgical face masks

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Summary

Methods

- The authors investigated and reported the efficacy of surgical facemasks (Kimberly Clark) to prevent respiratory viruses (influenza virus, coronavirus and rhinovirus) transmission in exhaled respiratory droplets and aerosols
- A total of 246 patients attending general outpatient clinics presenting with at least two symptoms of Acute Respiratory Illness (ARI) within 3 days of onset were recruited in the study
- Each participant was randomly allocated in a 1:1 ratio to either wearing a surgical face mask or not wearing a surgical mask
- Exhaled breath samples were collected from both groups of subjects using a Gesundheit II (G-II) bioaerosol collecting device, natural coughing was allowed and recorded; 29% participants did not cough.
- The subjects sat apposing their face into the inlet of the bioaerosol collecting device shaped like a truncated cone which has continuous inflow of air at 130L/min to efficiently capture all respiratory particles released from the subject
- Coarse particles $>5\ \mu\text{m}$ (respiratory droplets) in the exhaled breath were collected by a 5- μm slit inertial Teflon impactor placed distal to the inlet of the aerosol collecting device and the remaining fine particles $\leq 5\ \mu\text{m}$ (respiratory aerosols) were condensed and collected into approximately 170 ml of 0.1% BSA/PBS
- Viral concentration of specific virus in the samples collected was measured using RT-PCR on nasal and throat swabs, respiratory droplets and aerosols

Results

- Surgical facemasks significantly reduced the detection of influenza virus RNA in exhaled respiratory droplets and coronavirus RNA in aerosols. Wearing of surgical facemasks did not reduce the detection of coronavirus RNA in larger respiratory droplets even though it was effective against viral transmission in smaller respiratory aerosols.
- Surgical facemasks did not reduce the detection of rhinovirus RNA in both respiratory aerosols and droplets.
- Majority of the participants with influenza virus (15/23) and coronavirus infections (6/10) who did not wear masks while exhaled breath samples were collected, did not shed detectable virus in the respiratory droplets and aerosols; while the remaining shed low load of virus.
- Therefore, given the high collection efficiency of the G-II aerosol collecting device and considering the fact that each exhaled breath collection was conducted for 30 minutes, it might imply that prolonged closecontact would be required for transmission to occur.

Conclusions

- Wearing of surgical face mask could prevent transmission of human coronaviruses and influenza viruses from symptomatic individuals even with variability in contagiousness.
- Prolonged close contact for 30 minutes may be required for droplet and aerosol transmission to occur without use of masks.

Appraisal

- Strengths: Randomised design for the intervention. Paucity of literature in the domain. Exhaled breath particles were separated as larger ($>5\ \mu\text{m}$) droplets and smaller ($<5\ \mu\text{m}$) aerosols.
- Limitations:
 - Very small sample size ($n=11$ and $n=10$, for the intervention and control arms respectively for the data on Corona virus)
 - The reported data on protective efficacy of surgical masks which could effectively reduce virus transmission in aerosols but not in larger respiratory droplets containing corona virus seems incongruous and defies logic.
 - Limited sampling time of only 30 min for collection of exhaled breath samples, forced coughing was not encouraged for better yield.
 - Data was collected during 2013-16 and does not apply to current pandemic of Sars-CoV-2

Opinion

- The article reports the protective efficacy of wearing of surgical facemasks by patients with ARI against transmission of coronaviruses and influenza viruses in exhaled respiratory aerosols and droplets. The findings reported with reference to coronavirus are based on data constrained by poor sample size and not collected during the current pandemic of Sars-CoV-2.

Appraisers:

Dinu Chandran, KK Deepak, Sidhartha Satpathy, AIIMS, New Delhi