# Evidence Search Service Results of your search request

## Infection and death rates of MERS and SARS in people with ACEi

**ID of request:** 22306  
**Date of request:** 16th March, 2020  
**Date of completion:** 19th March, 2020

If you would like to request any articles or any further help, please contact:  Lisa Mason at [Lisa.Mason@geh.nhs.uk](mailto:Lisa.Mason@geh.nhs.uk)

Please acknowledge this work in any resulting paper or presentation as: Evidence search: Infection and death rates of MERS and SARS in people with ACEi. Lisa Mason. (19th March, 2020). NUNEATON, UK: George Eliot Hospital William Harvey Library.

**Sources searched**  
EMBASE (6)  
MEDLINE (3)

**Date range used** (5 years, 10 years): All   
**Limits used** (gender, article/study type, etc.): Human   
**Search terms and notes** (full search strategy for database searches below):

HDAS search of MEDLINE and EMBASE

WHO statistics give overall death rates, but don't list co-morbidities

The following results have some statistical data around MerS and SARS and diabetes, however it is proving difficult to locate statistics around ACEi and the viruses.

For more information about the resources please go to: <https://geh.wordpress.ptfs-europe.co.uk>.

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## A. Original Research

1. **Diabetes mellitus, hypertension, and death among 32 patients with MERS-CoV infection, Saudi Arabia**  
   Alanazi K.H. Emerging Infectious Diseases 2020;26(1):166-168.

Diabetes mellitus and hypertension are recognized risk factors for severe clinical outcomes, including death, associated with Middle East respiratory syndrome coronavirus infection. Among 32 virus-infected patients in Saudi Arabia, severity of illness and frequency of death corresponded closely with presence of multiple and more severe underlying conditions.<br/>Copyright &#xa9; 2020 Centers for Disease Control and Prevention (CDC). All rights reserved.

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1. **The risk factors associated with MERS-CoV patient fatality: A global survey**  
   Ahmadzadeh J. Diagnostic Microbiology and Infectious Disease 2020;96(3):No page numbers.

Risk factors associated with Middle East respiratory syndrome coronavirus (MERS-CoV) infection outcome were established by analyses of WHO data from September 23, 2012 to 18 June 2018. Of the 2220 reported cases, 1408 cases, including 451 MERS-CoV deaths, were analyzed. The case fatality rate was 32% (95% CI: 29.4-34.5). Compared to MERS patients &lt;=30 years old, those with &gt;30 years had the adjusted odds ratio estimate for death of 2.38 [95% CI: 1.75-3.22]. This index was 1.43 [95% CI: 1.06-1.92] for Saudi patients in comparison to non-Saudi; 1.76 [95% CI: 1.39-2.22] for patient with comorbidity in comparison to those without comorbidity; 0.58 [95% CI: 0.44-0.75] for those who had close contact to a camel in the past 14 days and 0.42 [95% CI: 0.31-0.57] for patients with &gt;14 days with onset of signs and hospital admission compared to patients with &lt;=14 days.<br/>Copyright &#xa9; 2019

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1. **Clinical outcomes of current medical approaches for Middle East respiratory syndrome: A systematic review and meta-analysis.**  
   Morra Mostafa Ebraheem Reviews in medical virology 2018;28(3):e1977.

Middle East respiratory syndrome (MERS) is a respiratory disease caused by MERS coronavirus. Because of lack of vaccination, various studies investigated the therapeutic efficacy of antiviral drugs and supportive remedies. A systematic literature search from 10 databases was conducted and screened for relevant articles. Studies reporting information about the treatment of MERS coronavirus infection were extracted and analyzed. Despite receiving treatment with ribavirin plus IFN, the case fatality rate was as high as 71% in the IFN-treatment group and exactly the same in patients who received supportive treatment only. Having chronic renal disease, diabetes mellitus and hypertension increased the risk of mortality (P < .05), and chronic renal disease is the best parameter to predict the mortality. The mean of survival days from onset of illness to death was 46.6 (95% CI, 30.5-62.6) for the IFN group compared with 18.8 (95% CI, 10.3-27.4) for the supportive-only group (P = .001). Delay in starting treatment, older age group, and preexisting comorbidities are associated with worse outcomes. In conclusion, there is no difference between IFN treatment and supportive treatment for MERS patients in terms of mortality. However, ribavirin and IFN combination might have efficacious effects with timely administration and monitoring of adverse events. Large-scale prospective randomized studies are required to assess the role of antiviral drugs for the treatment of this high mortality infection.

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1. **Current medical treatment for middle east respiratory syndrome: A systematic review**  
   Van Le T. American Journal of Tropical Medicine and Hygiene 2017;97(5):262.

Middle East Respiratory Syndrome (MERS) is a novel viral respiratory disease caused by MERS-Coronavirus (MERS-CoV), and the first reported case was in Saudi Arabia in 2012. There is no specific treatment for MERS, and it ranges from supportive treatment to antiviral treatment like interferon (IFN) a 1a, IFN b 1a, and ribavirin. We conducted a systematic search on ten databases Studies published after 1/1/2012 and reporting information about treatment of MERS-CoV infection were included in our review. We used Mann-Whitney U, Chi2 and Fisher's exact tests to investigate the relation between the mortality outcome and independent variables. Classification tree model was used to find the best predictors of the mortality. We included 16 papers including ten case reports, two case series, and four observational studies. Despite receiving treatment with ribavirin plus IFN, the mortality rate was as high as 71% of 68 patients in IFN-treatment group and exactly the same (71% of 48 patients) in patients who received supportive treatment only. There was a significant difference between died and survived patients in chronic respiratory disease (CRD), diabetes mellitus (DM), hypertension, renal replacement therapy and ventilation. Indicating that having CRD, hypertension or DM and being ventilated increase the risk of mortality (for all of these factors). While there was no significant difference between died and survived patients in gender, ribavirin, corticosteroid, oseltamivir, IFN beta 1a, IFN alpha 2b, IFN alpha 2a, congestive heart failure (CHF), other comorbidities (p less than 0.05). There was a significant difference between died and survived patient in age, being older in died patients, and time from admission to antiviral treatment start being larger in died patients as well (p less than 0.05). The IFN treatment has shown no efficacy over supportive treatment only. Antiviral treatment delay, older age group, and co-morbidities preexistence (hypertension, diabetes mellitus, chronic kidney disease, dialysis dependent) were associated with worse outcome.

[Journal of Tropical Medicine and Hygiene this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=aa924fad942a851cddd19e20ed4bc6c2)

1. **Prevalence of comorbidities in the Middle East respiratory syndrome coronavirus (MERS-CoV): a systematic review and meta-analysis.**  
   Badawi Alaa International journal of infectious diseases : IJID : official publication of the International Society for Infectious Diseases 2016;49:129-133.

The Middle East respiratory syndrome coronavirus (MERS-CoV) is associated with life-threatening severe illnesses and a mortality rate of approximately 35%, particularly in patients with underlying comorbidities. A systematic analysis of 637 MERS-CoV cases suggests that diabetes and hypertension are equally prevalent in approximately 50% of the patients. Cardiac diseases are present in 30% and obesity in 16% of the cases. These conditions down-regulate the synthesis of proinflammatory cytokines and impair the host's innate and humoral immune systems. In conclusion, protection against MERS-CoV and other respiratory infections can be improved if public health vaccination strategies are tailored to target persons with chronic disorders.

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1. **The role of diabetes in the severity of 2009 influenza A (H1N1) and the Middle East respiratory syndrome coronavirus (MERS-CoV): A systematic review and meta-analysis**  
   Badawi A. International Journal of Infectious Diseases 2016;45:165.

Background: A number of acute respiratory infections outbreaks such as the 2009 influenza A (H1N1) and the Middle East respiratory syndrome coronavirus (MERS-CoV) have emerged and presented a considerable global public health threat. Epidemiologic evidence suggest that diabetic subjects are more susceptible to these conditions. However, the global influence of diabetes to the severity of H1N1 and MERS-CoV is yet to be evaluated. <br/>Objective(s): The aim of this study was to carry out a systematic review and meta-analysis documenting the prevalence of diabetes in sever H1N1 and MERS-CoV to enable estimating its contribution to the severity of these conditions. Methods & Materials: A search strategy was developed for online databases (PubMed, Ovid MEDLINE, Embase and Embase Classic) using H1N1, MERS-CoV and DIABETES as search terms. Reports documenting the prevalence of diabetes in these conditions were identified. Meta-analysis for the proportions of diabetes in sever conditions (95% confidence intervals, CI) was carried out (29 H1N1 studies, n=92,948 subjects and 9 MERS-CoV studies, n=308). Weighted averages of the extracted information and subgroup analysis (by region) were carried out. <br/>Result(s): Average age of H1N1 patients (38.0+/-9.2 yrs) was lower than that MERS-CoV patients (54.9+/-10.1 yrs, p&lt;0.05). The prevalence rates of clinical symptoms such as pyrexia, dyspnea, pharyngitis and pertussis were comparable between the two conditions. Compared to MERS-CoV patients, H1N1 subjects exhibited 3-fold lower prevalence of cardiovascular diseases and 2- and 4- fold higher obesity and immunosuppression rates, respectively. The prevalence of diabetes in severH1N1was 14.6% (95%CI: 12.3-17.0%; p&lt;0.001), a 3.7-fold lower than in MERS-CoV (54.4%; 95%CI: 29.4- 79.5; p&lt;0.001). The contribution of diabetes to the severity of H1N1 from Asia (18%) and North America (20%) was 2-fold higher than that from South America (9.8%) and Europe (10%). <br/>Conclusion(s): The effect of diabetes is 4-fold higher in MERS-CoV than in H1N1 and may play a significant role in the susceptibly to these conditions and vulnerability to their ensuing sever complications. The high prevalence of diabetes in H1N1 in North America and Asia may reflect its elevated prevalence in these regions.

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1. **Binding of SARS coronavirus to its receptor damages islets and causes acute diabetes.**  
   Yang Jin-Kui Acta diabetologica 2010;47(3):193-199.

Multiple organ damage in severe acute respiratory syndrome (SARS) patients is common; however, the pathogenesis remains controversial. This study was to determine whether the damage was correlated with expression of the SARS coronavirus receptor, angiotensin converting enzyme 2 (ACE2), in different organs, especially in the endocrine tissues of the pancreas, and to elucidate the pathogenesis of glucose intolerance in SARS patients. The effect of clinical variables on survival was estimated in 135 SARS patients who died, 385 hospitalized SARS patients who survived, and 19 patients with non-SARS pneumonia. A total of 39 SARS patients who had no previous diabetes and received no steroid treatment were compared to 39 matched healthy siblings during a 3-year follow-up period. The pattern of SARS coronavirus receptor-ACE2 proteins in different human organs was also studied. Significant elevations in oxygen saturation, serum creatinine, lactate dehydrogenase, creatine kinase MB isoenzyme, and fasting plasma glucose (FPG), but not in alanine transaminase were predictors for death. Abundant ACE2 immunostaining was found in lung, kidney, heart, and islets of pancreas, but not in hepatocytes. Twenty of the 39 followed-up patients were diabetic during hospitalization. After 3 years, only two of these patients had diabetes. Compared with their non-SARS siblings, these patients exhibited no significant differences in FPG, postprandial glucose (PPG), and insulin levels. The organ involvements of SARS correlated with organ expression of ACE2. The localization of ACE2 expression in the endocrine part of the pancreas suggests that SARS coronavirus enters islets using ACE2 as its receptor and damages islets causing acute diabetes.

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1. **Plasma glucose levels and diabetes are independent predictors for mortality and morbidity in patients with SARS**  
   Yang J.K. Diabetic Medicine 2006;23(6):623-628.

Aims: To investigate the relationships between a known history of diabetes and ambient fasting plasma glucose (FPG) levels with death and morbidity rates in patients with severe acute respiratory syndrome (SARS). <br/>Method(s): In this retrospective analysis, the clinical and biochemical characteristics of 135 patients who had died from SARS, 385 survivors of SARS and 19 patients with non-SARS pneumonia were compared. <br/>Result(s): All patients were treated according to a predefined protocol. Before steroid treatment, the mean FPG level was significantly higher in the SARS group (deceased vs. survivors vs. non-SARS pneumonia group: 9.7 +/- 5.2 vs. 6.5 +/- 3.0 vs. 5.1 +/- 1.0 mmol/l, P &lt; 0.01). In the SARS group, the percentage of patients with a known history of diabetes was significantly higher in the deceased patients than in the survivors (21.5% vs. 3.9%, P &lt; 0.01). Among patients with no known history of diabetes and before commencement of steroid therapy, those who had hypoxaemia (SaO2 &lt; 93%) had higher FPG levels than those who did not have hypoxia in both the survivor (8.7 +/- 4.9 vs. 6.3 +/- 2.1 mmol/l, P &lt; 0.001) and deceased (9.8 +/- 4.8 vs. 7.2 +/- 1.5 mmol/l, P &lt; 0.001) groups. A known history of diabetes [odds ratio (OR) 3.0, 95% confidence interval (CI) 1.4, 6.3; P = 0.005] and FPG &gt;= 7.0 mmol/l before steroid treatment (OR 3.3, 95% CI 1.4, 7.7, P = 0.006) were independent predictors of death. During the course of the illness, FPG levels were negatively associated with SaO2 (beta = -0.682 +/- 0.305, P = 0.025, general estimation equation model) in SARS patients. Survival analysis showed that FPG was independently associated with an increased hazard ratio (HR) of mortality (HR = 1.1, 95% CI 1.0, 1.1, P = 0.001) and hypoxia (HR = 1.1, 95% CI 1.0, 1.1, P = 0.002) after controlling for age and gender. <br/>Conclusion(s): A known history of diabetes and ambient hyperglycaemia were independent predictors for death and morbidity in SARS patients. Metabolic control may improve the prognosis of SARS patients. &#xa9; 2006 Diabetes.

1. **SARS: Epidemiology**  
   Chan-Yeung M. Respirology 2003;8:No page numbers.

Severe acute respiratory syndrome (SARS) originated in Southern China in November 2002, and was brought to Hong Kong in February 2003. From Hong Kong, the disease spread rapidly worldwide but mostly to Asian countries. At the end of the epidemic in June, the global cumulative total was 8422 cases with 916 deaths (case fatality rate of 11%). People of all ages were affected, but predominantly females. Health care workers were at high risk and accounted for one-fifth of all cases. Risk factors for death included old age and comorbid illnesses, especially diabetes. The disease is caused by a novel coronavirus and is transmitted by droplets or direct inoculation from contact with infected surfaces. Contaminated sewage was found to be responsible for the outbreak in a housing estate in Hong Kong affecting over 300 residents. The mean incubation period was 6.4 days (range 2-10). The duration between onset of symptoms and hospitalisation was from 3 to 5 days. The relatively prolonged incubation period allowed asymptomatic air travellers to spread the disease globally. The number of individuals infected by each case has been estimated to be 2.7. Effective control of nosocomial transmission included early detection of disease, strict isolation of patients, practice of droplet and contact precautions and compliance with the use of personal protective equipment. Effective control of disease spread in the community included tracing and quarantine of contacts. Development of a validated diagnostic test and an effective vaccine as well as elimination of possible animal reservoirs are measures needed to prevent another epidemic.

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