

Post–September 11, 2001, Incidence of Systemic Autoimmune Diseases in World Trade Center–Exposed Firefighters and Emergency Medical Service Workers

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Abstract

Objective: To estimate the incidence of selected systemic autoimmune diseases (SAIDs) in approximately 14,000 male rescue/recovery workers enrolled in the Fire Department of the City of New York (FDNY) World Trade Center (WTC) Health Program and to compare FDNY incidence to rates from demographically similar men in the Rochester Epidemiology Project (REP), a population-based database in Olmsted County, Minnesota.

Patients and Methods: We calculated incidence for specific SAIDs (rheumatoid arthritis, psoriatic arthritis, systemic lupus erythematosus, and others) and combined SAIDs diagnosed from September 12, 2001, through September 11, 2014, and generated expected sex- and age-specific rates based on REP rates. Rates were stratified by level of WTC exposure (higher vs lower). Standardized incidence ratios (SIRs), which are the ratios of the observed number of cases in the FDNY group to the expected number of cases based on REP rates, and 95% CIs were calculated.

Results: We identified 97 SAID cases. Overall, FDNY rates were not significantly different from expected rates (SIR, 0.97; 95% CI, 0.77-1.21). However, the lower WTC exposure group had 9.9 fewer cases than expected, whereas the higher WTC exposure group had 7.7 excess cases.

Conclusion: Most studies indicate that the healthy worker effect reduces the association between exposure and outcome by about 20%, which we observed in the lower WTC exposure group. Overall rates masked differences in incidence by level of WTC exposure, especially because the higher WTC exposure group was relatively small. Continued surveillance for early detection of SAIDs in high WTC exposure populations is required to identify and treat exposure-related adverse effects.

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Systemic autoimmune diseases (SAIDs) are relatively rare in North American and European populations and predominantly affect women (>75% of cases). Published incidence and prevalence estimates vary considerably, due, in part, to differences in characteristics of the underlying population that are associated with disease prevalence. Further, diagnoses may be based on clinical judgment rather than diagnostic criteria. The few studies of SAID incidence in occupational

cohorts are subject to similar limitations, relying on self-reported diagnoses from survey responses^{1,2} or on diagnoses from death certificates.³ The lack of SAID incidence studies in specific occupational groups impedes efforts to identify nongenetic risk factors that might contribute to differences in disease distribution by occupation and over time.

The terrorist attacks on the World Trade Center (WTC) on September 11, 2001 (9/11), with subsequent building collapses and fires,



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exposed thousands of rescue/recovery workers and residents to aerosolized WTC dust—an amalgam of pulverized cement, glass fibers, silica, asbestos, lead, polycyclic aromatic hydrocarbons, polychlorinated biphenyls, and polychlorinated furans and dioxins.⁴ Environmental sampling of the area around New York City identified 287 chemicals and chemical groups⁵; some had previously been linked to SAIDs in non-WTC-exposed workers.

The Fire Department of the City of New York (FDNY) WTC Health Program monitors a cohort of approximately 16,000 firefighters and emergency medical service (EMS) workers who participated in rescue/recovery efforts at the WTC site. Clinical observations of SAIDs in this mostly healthy, white male cohort triggered an interest in estimating the incidence of SAIDs in this population. The current study includes the following diagnoses: rheumatoid arthritis (RA), spondyloarthritis (psoriatic arthritis, seronegative arthritis, and ankylosing spondylitis), systemic lupus erythematosus (SLE), inflammatory myositis (polymyositis and dermatomyositis), antiphospholipid syndrome, Sjögren syndrome, systemic sclerosis (scleroderma), granulomatosis with polyangiitis (formerly, Wegener granulomatosis), and eosinophilic granulomatosis with polyangiitis (Churg-Strauss syndrome). We excluded sarcoidosis because we⁶ and others^{7,8} have previously reported on sarcoidosis after WTC exposure.

The primary study aims were to (1) estimate the incidence of SAIDs from September 12, 2001, through September 11, 2014, in male WTC-exposed FDNY rescue/recovery workers and (2) compare SAID incidence in our WTC-exposed cohort to rates from demographically similar men from Olmsted County, Minnesota, and to other published rates.

PATIENTS AND METHODS

Fire Department of the City of New York

We obtained information from FDNY employee databases, self-administered health questionnaires, FDNY physician records, and rheumatologist-reviewed patient medical records and self-reported information.

The FDNY WTC Health Program schedules monitoring evaluations of the WTC-exposed workforce every 12 to 18 months. This visit

includes a physical examination and completion of a self-administered health questionnaire. In 2005, we added a question about doctor-diagnosed SAIDs, and in 2009, we created an autoimmune registry to capture potential cases in 2 ways. Most commonly, potential cases were reported on the physical health questionnaires. Specifically, the question asks: “Since your last FDNY WTC annual medical, has a doctor or health professional told you that you have arthritis or any autoimmune disease listed below?” Answer choices include “rheumatoid arthritis,” “lupus,” “polymyositis/dermatomyositis,” and “other, for example, psoriatic arthritis or scleroderma.” Additionally, the registry included potential cases reported to an FDNY physician during a medical monitoring examination or a treatment visit. This information was recorded as part of the patient medical history.

The FDNY WTC disease registry clinician (N.J.) called all 739 patients in the autoimmune registry who potentially had SAID; 522 (70.6%) reported no diagnosis of autoimmune disease by a physician and were determined to be “reporting errors.” Of the remaining 217 possible cases, 63 were confirmed by documentation from treating physicians/rheumatologists that included the specific SAID diagnosis, treatment plan (medications), and approximate diagnosis date (month and year). We also identified 34 “probable” cases. Probable cases were patients who did not submit adequate documentation from their treating physician by the close of the study but reported an SAID diagnosis, met criteria of the initial screening phone call, and provided at least one piece of evidence supporting an SAID diagnosis, most commonly a medication used almost exclusively for SAIDs, as determined by 2 board-certified rheumatologists (J.B., B.Q.). Excluded possible cases (N=120) included 61 patients that the rheumatologists concluded lacked sufficient evidence for probable SAID and 59 patients we were unable to contact by either phone or mail. The final case population consisted of 63 confirmed and 34 probable SAID cases (N=97). Confirmed diagnoses met American College of Rheumatology criteria for SAID.⁹⁻¹⁵ The study was approved by the institutional review board at Montefiore Medical Center.

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