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AN EXPOSURE–RESPONSE ANALYSIS OF RESPIRATORY DISEASE RISK ASSOCIATED WITH OCCUPATIONAL EXPOSURE TO CHRYSOTILE ASBESTOS

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INTRODUCTION

There has been considerable debate in the scientific literature concerning the significance of the risks associated with exposure to chrysotile asbestos (Mossman *et al.*, 1990; Stayner *et al.*, 1996). This paper presents the findings from exposure–response and risk analyses of lung cancer and asbestosis mortality based on a cohort mortality study of U.S. textile workers exposed to chrysotile asbestos.

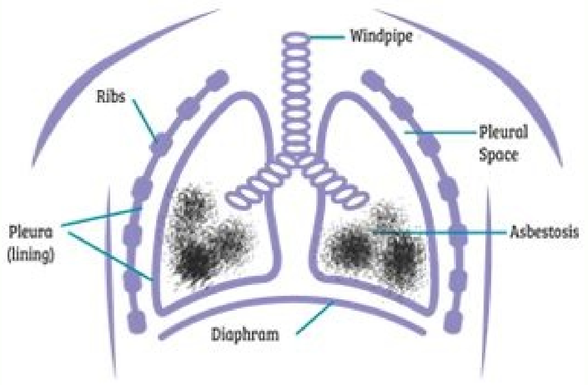
MATERIAL AND METHODS

Data were used from a recent update of a cohort mortality study of workers exposed to chrysotile asbestos in a South Carolina textile factory (Dement *et al.*, 1994). The analysis was restricted to include workers employed in the textile production operations for at least 1 month between 1 January, 1940 and 31 December, 1975. Follow-up of this cohort for vital status was until 31 December, 1990. Chrysotile exposure levels by areas of the plant, specific jobs and calendar years have been previously estimated and were used with work history information to estimate individual cumulative exposures for this analysis.

Exposure–response analyses were conducted for cancers of the trachea, bronchus and lung ("lung cancer") and for asbestosis and pneumoconiosis ("asbestosis"). The underlying cause of death was used for lung cancer (ICD9 = 162) and a multiple cause of death approach (Steenland *et al.*, 1992) was used for "asbestosis" (ICD9 = 501 and 505). Based on these definitions, there was a total of 126 lung cancer and 45 cases of asbestosis available for analysis.

Poisson regression methods were used to analyze the exposure–response relationship between chrysotile asbestos exposure and respiratory disease mortality. For lung cancer, the person–years and observed deaths were restricted to include only those with at least 15 years of time since the date of first exposure.

A wide variety of parametric models were evaluated including additive, log–linear, log–quadratic, additive relative rate and power function models (Stayner *et al.*, 1995). The fit of these models was contrasted by comparing their deviances and by graphically comparing them with a categorical model, and a restricted cubic



Asbestosis
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RESUMEN

La asbestosis es una fibrosis pulmonar intersticial difusa secundaria a la inhalación de fibras de asbesto. Existe una relación dosis respuesta entre la exposición a asbesto y riesgo de desarrollar asbestosis, de tal forma que a mayor exposición, mayor riesgo de desarrollar la enfermedad. El tiempo de latencia clínica es inversamente proporcional al nivel de exposición. La disnea de esfuerzo y la tos seca junto con los crepitantes inspiratorios tardíos son los síntomas y signos más frecuentes. La radiografía de tórax constituye un instrumento básico en la identificación de la enfermedad, no obstante el TAC de alta resolución ha añadido una mayor sensibilidad. Las pruebas de función respiratoria muestran alteraciones ventilatorias restrictivas con disminución de la difusión pulmonar. La determinación de cuerpos de asbesto en BAL es un indicador de exposición aunque su ausencia no descarta enfermedad. El diagnóstico de certeza es histopatológico aunque en la mayor parte de los casos se establece el diagnóstico basándose en la existencia de antecedente de exposición a asbesto junto con hallazgos clínicos, radiológicos y funcionales sugestivos y tiempo de latencia adecuado sin recurrir a la biopsia pulmonar.

Palabras clave. Asbesto. Asbestosis.

ABSTRACT

Asbestosis is a diffuse interstitial pulmonary fibrosis, secondary to the inhalation of asbestos fibres. There is a dose-response relationship between exposure to asbestos and the risk of developing asbestosis, in such a way that the greater the exposure, the greater the risk of developing the disease. The time of clinical latency is inversely proportional to the level of exposure. Dyspnoea upon exertion and a dry cough together with end-inspiratory crackles are the most frequent symptoms and signs. Chest radiography is a basic tool in identifying the disease, however high resolution CAT has added greater sensitivity. Tests of the respiratory functios show alterations and restrictive ventilations with a reduction of pulmonary spread. Determination of asbestos bodies in BAL is an indicator of exposure, although their absence does not rule out the disease. A histopathological diagnosis is the most reliable, although in the majority of cases the diagnosis is established on the basis of the existence of an antecedent of exposure to asbestos together with suggestive clinical, radiological and functional findings, and a suitable time of latency, without having recourse to a pulmonary biopsy.

Key words. Asbestos. Asbestosis.

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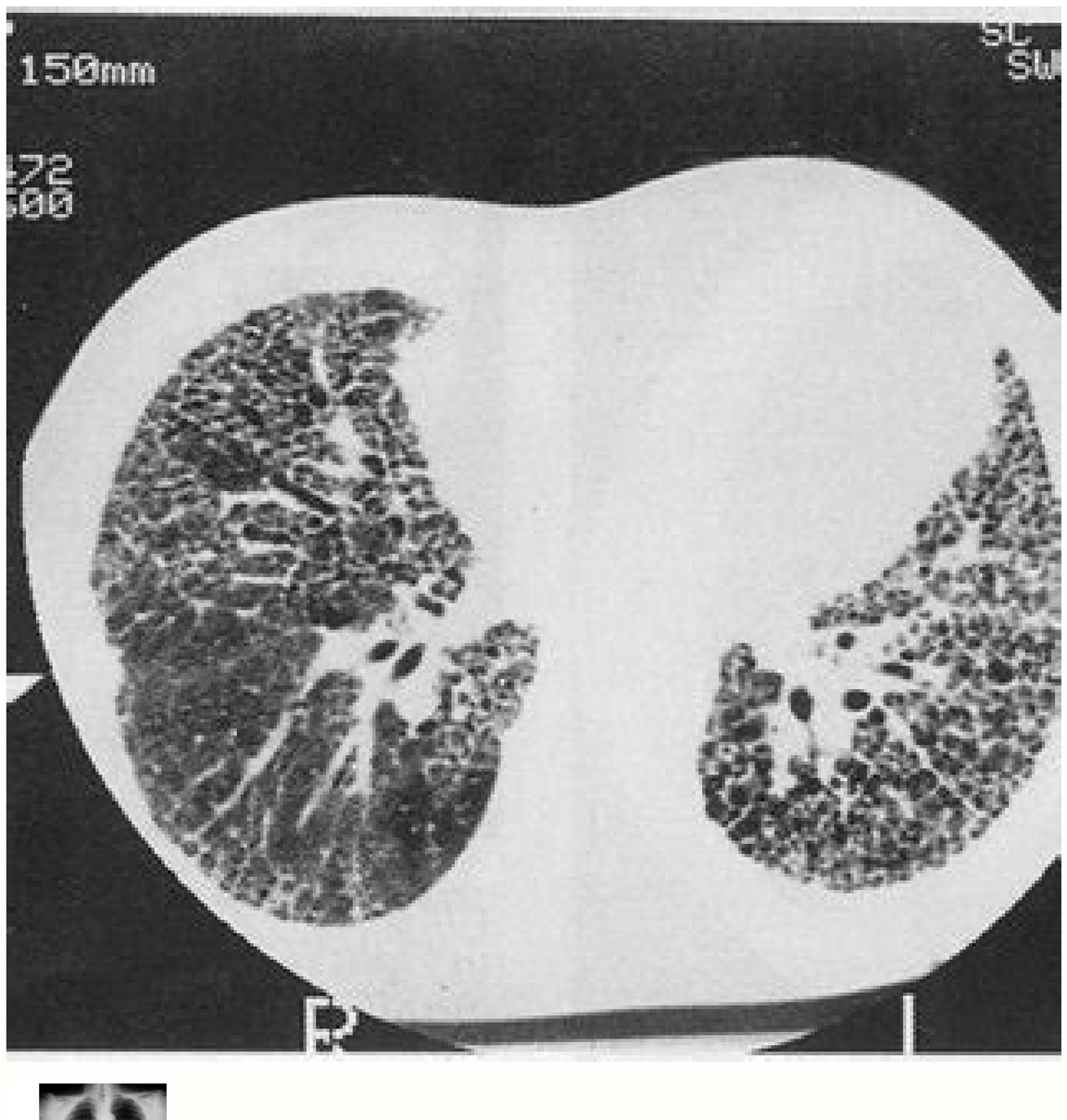

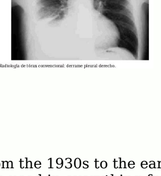

Figura 1. Radiología de tórax convencional: derrame pleural derecho.

Asbestosis disease in hindi. Asbestosis disease causes. Asbestosis disease meaning in hindi. Asbestosis disease progression. Asbestosis disease affects. Symptoms of asbestosis disease. Asbestosis disease lung cancer. Asbestosis disease other names.

From the 1930s to the early 1980s, asbestos was one of the most common materials used in the United States. Asbestos was prominently used in many industries due to its natural fire resistance, sound absorption, and insulation properties. For example, most American buildings constructed during that period contained asbestos fibers. Asbestos was also used in everything from construction materials to household products like cookware and even toothpaste. Yet inhaling stray asbestos fibers could cause deadly diseases over time. When stray asbestos fibers enter the air, they can enter the body and get lodged in major body parts like the lungs. These fibers remain in the body forever once inside and slowly irritate healthy cells until asbestos diseases develop. There are six types of asbestos, according to the National Cancer Institute (NCI), all of which are dangerous to human health. Hundreds of thousands of people have developed diseases caused by occupational exposure according to the World Health Organization (WHO). This is because the general public didn’t know how dangerous the material was — the manufacturers of asbestos-containing products hid the dangers to keep making money. Today, many innocent people get sick and die from asbestos-related diseases like mesothelioma each year. Asbestos Disease Groups There are two main asbestos disease groups: These are abnormal cell growths that don’t spread to affect other body parts like cancer does. While these diseases — including asbestosis and pleural plaques — can be managed with treatment, they’re rarely curable and some can even be fatal. These cancers can be temporarily managed but are usually very aggressive and deadly. This category includes lung cancer, mesothelioma, and other cancers. It’s important to know that not everyone exposed to asbestos fibers will develop an asbestos-related disease. Many factors play into a person’s risk of disease, including how much asbestos they were exposed to and how long they were exposed. Additionally, some are more genetically predisposed to developing an asbestos disease. Others have lifestyle issues that severely increase risk. For example, smokers have a higher risk of lung cancer or other asbestos-related lung diseases after exposure than non-smokers. Benign Asbestos-Related Diseases The medical definition of a “benign” tumor means that it isn’t cancerous. But, so-called “benign” asbestos diseases are still dangerous to human health. Find a breakdown of each benign asbestos disease below. Asbestosis Asbestosis, or diffused pulmonary fibrosis, is a common asbestos disease in which the inner lung tissue gets severely scarred after prolonged exposure to the mineral. This causes pain and severe difficulty in breathing. When tiny asbestos fibers impale the lung surface, the body’s immune system naturally forms scar tissue in an attempt to heal these foreign invaders. Asbestosis is not fatal like cancerous tumors, but it can lead to respiratory or cardiac failure since the condition worsens over time. Pleural Plaques Pleural plaques are calcified forms of collagen (the body’s most common protein). When a foreign substance — such as asbestos fibers — enters a person’s body, a natural immune response may take place and cause pleural plaques to accumulate. Pleural plaques occur when the membranes of the lungs and the inside of the ribcage thicken, causing a build-up of calcified collagen (plaque). Pleural plaques are usually not dangerous and often there are no symptoms, according to the British Lung Foundation (BLF). In rare cases, pleural plaques become widespread and thick. This usually indicates a more serious asbestos-related pleural disease, such as some form of cancer. Pleural Effusion Pleural effusion is an excess fluid build-up in the lungs. Pleural effusions occur between pleural layers, such as between the lung tissue and the mesothelium (outer layer of the lungs). It causes symptoms such as a dry cough, difficulty breathing, and chest pain, according to the Cleveland Clinic. Doctors can surgically drain pleural effusions to ease these symptoms. Pleural effusions are sometimes a symptom of mesothelioma. Other Benign Asbestos Diseases Several other benign diseases and conditions are associated with asbestos exposure, although they’re not common. Other benign asbestos diseases include: Diffuse pleural thickening: This condition occurs when scarring thickens the lining of the lungs and chest wall, according to the British Lung Foundation (BLF). Atelectasis: This is the medical term for a partially deflated or collapsed lung, according to the Mayo Clinic. This condition causes coughing, wheezing, and difficulty breathing. Peritoneal or pericardial effusions: Much like pleural effusions, these conditions occur when fluid builds up in the lining of the abdomen or heart, respectively. Chronic obstructive pulmonary disease (COPD): This progressive disease causes difficulty breathing and may lead to even worse illnesses like lung cancer, according to the Mayo Clinic. It is often caused by smoking, but inhaling asbestos fibers can also trigger this disease. There is even an asbestos disease known as clubbed fingers where fingertips become box-like. This condition is often associated with asbestosis, according to the Mayo Clinic. Malignant Asbestos-Related Diseases The link between asbestos exposure and cancer risk is significant. Malignant (cancerous) diseases caused by asbestos exposure have a limited prognosis for long-term survival. The best hope for dealing with cancer is catching it early and taking immediate action to remove or destroy the tumors. Unfortunately, malignant asbestos diseases take such a long time for the symptoms to present that they usually have spread throughout the body, making treatments difficult. Exactly how asbestos causes cancer is a phenomenon not fully understood by medical science. There is overwhelming proof they do, though. Asbestos particles are mineral-based. They can’t be broken down by the immune system as organic and biological impurities can be. Asbestos scarring in a lung or other organ tissue turns cancerous because healthy cells become damaged and their DNA changes. These cells rapidly multiply rather than die and replace themselves. In the process, these rogue cells damage other organs and shut them down, killing the host. Malignant tumor cells spread or metastasize to other areas. Often, they invade a neighboring organ or travel through the lymphatic system to distant parts of the body, including other major organs like the brain. Lung Cancer Lung cancer is a common and highly deadly asbestos disease. While other carcinogens like tobacco smoke, radon, and heavy metals are the most likely causes of lung cancer, asbestos exposure is responsible for an estimated 20% of all cases. Lung cancer tumors form in the inner pleural tissue. Left unchecked, this cancer significantly impairs lung function and can be fatal. Treatment for this asbestos disease includes a combination of surgery, chemotherapy, and radiation. Mesothelioma Malignant mesothelioma does not just affect one part of the body. It can appear in several different areas and spread widely via the lymph nodes. This aggressive cancer is extremely deadly. Pleural mesothelioma: This is the most common type of mesothelioma, developing in the lining of the lungs (the pleura). It can cause pain in the chest, ribs, shoulders, and upper back. Other symptoms include coughing up blood, shortness of breath, difficulty breathing, and weight loss. Peritoneal mesothelioma: This type of mesothelioma forms in the lining of the abdominal cavity (the peritoneum). Common symptoms include abdominal pain, constipation, swelling due to fluid buildup, nausea, blood in stool (feces), and vomiting. Less common symptoms include pain in the upper back and ribs. Pericardial mesothelioma: With this type of mesothelioma, tumors first develop in the lining of the heart (the pericardium). It can cause an irregular heartbeat or heart murmurs, chest pain, and shortness of breath. Testicular mesothelioma: This rare form of mesothelioma starts in the tunica vaginalis (testicle lining). It often causes swelling or masses of tissues to form around the testicles, according to the Mayo Clinic. Because mesothelioma can develop in different parts of the body — and the symptoms can mimic more common, less deadly illnesses — it’s important for patients to tell their doctor about any exposure to asbestos in the past. This can help doctors make a proper diagnosis. Ovarian Cancer Ovarian cancer accounts for only 3% of female cancer cases, but it’s the most deadly. Ovarian cancer causes more deaths than any other form of women’s reproductive cancers. The International Agency for Research on Cancer (IARC) confirms asbestos exposure is a leading cause of this cancer. Laryngeal Cancer This cancer is rare but often attributed to asbestos exposure. Inhaled asbestos fibers become trapped in the larynx (voice box). Like in other organs, scar tissue forms and eventually turns into a tumor. Surgery followed by chemotherapy and radiation is the typical course of treatment for this asbestos disease. Other Cancers The Centers for Disease Control and Prevention (CDC) notes that asbestos exposure may increase the risk of other types of cancers. These cancers include: Colorectal cancer Pharyngeal (throat) cancer Stomach cancer More information is needed to definitively link these cancers to asbestos exposure, according to the American Cancer Society (ACS). Prognosis for Asbestos Diseases Benign asbestos diseases are not generally fatal unless left untreated or only discovered late in their advancement stage. The exception to this is asbestosis, which is the leading cause of death in all asbestos diseases. Cancerous asbestos diseases usually have a poor prognosis since they are hard to treat and spread aggressively without notice. Many people with cancer do not realize they are sick until the cancer has spread throughout the body. The key to handling every asbestos disease is early detection and intervention. Anyone who has experienced significant asbestos exposure should discuss this with their doctor, regardless if symptoms are absent. Simple physical exams, chest X-rays, and blood work can help diagnose asbestos diseases so treatments can start. Compensation for Asbestos-Related Diseases Anyone who has been diagnosed with an asbestos disease may be eligible for financial compensation from the manufacturers of asbestos-containing products. These manufacturers knew that their products could harm people but didn’t care — instead, they put profits over human life. Financial compensation from these manufacturers can pay for: Lost wages if the victim cannot work Medical treatments for asbestos diseases Anything else