

# Menace of Asbestos: Health Impact and Politics

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**Abstract Background:** Asbestos is identified as a hazardous substance of public health concern and has led to its regulation or ban in many countries. Local and international politics have hampered the regulation and outright ban of this hazardous substance in many countries. While UK and USA did not outright ban but regulated its use, most developing countries continue in the production, sale and use of asbestos mostly due to economic reasons. The objective of this review is to identify previous publications on asbestos highlighting health effects and politics bordering its regulation. Also to recommend measures to curtail its production, use and sale especially in developing countries. **Methods:** A systematic review to identify suitable studies from MEDLINE and Electronic search through GOOGLE for original, review articles and documents on politics, law and health effects of asbestos. A total of 19 articles and online documents were finally selected and reviewed after screening out those not falling within the inclusion criteria. **Results:** The materials used in this review highlight the negative health impact of asbestos in various countries. Factors identified as militating against effective regulation or ban of this hazardous substance in many countries includes politics, economic gain, ignorance and unavailability of safe asbestos substitutes. **Conclusion:** Though the production and sale of asbestos have decreased in many developed countries, many developing countries still trade in this hazardous substance with its attendant health consequences. Increased political will, continuous research on health impact and financial aid to developing nations to acquire alternatives will help to reduce the menace of asbestos.

**Keywords:** *asbestos, abatement, politics, mesotheliomas, asbestos-related diseases, developing countries*

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## 1. Introduction

Asbestos is a naturally occurring mineral recognized for its heat resistance, tensile strength and insulating properties, with a wide variety of applications ranging from fire-proof vests to home and commercial construction. It can be woven into fabric, and mixed with cement. Its properties were so desired that the United States military mandated its use in every branch of service. However, asbestos has been banned in more than 50 countries (not the U.S.), and its use has been dramatically restricted in others. [1]

Between 2000-3000 BC, embalmed bodies of Egyptian pharaohs were wrapped in asbestos clothing to protect the bodies from deterioration. In Finland, clay pots dating back to 2500 BC contained asbestos fibers, which are believed to strengthen the pots and make them resistant to fire. Around 456 BC, Herodotus, the classical Greek historian, referred to the use of asbestos shrouds wrapped around the dead before their bodies were tossed onto the funeral pyre to prevent their ashes from being mixed with those of the fire itself. Some scholars claim the word

asbestos comes from the ancient Greek term "sasbestos" meaning inextinguishable or unquenchable, a characterization of the material's invincibility from the intense heat of the fire pits used by the Greeks for cooking and warmth. [1,2,3,4]

Asbestos occurs naturally in large deposits on every continent in the world. Archeologists uncovered asbestos fibers in debris dating back 750,000 years. It is believed that as early as 4000 BC, asbestos long hair-like fibers were used for wicks in lamps and candles. Currently about 125 million people in the world are exposed to asbestos at the workplace. In 2004, asbestos-related lung cancer, mesothelioma and asbestosis from occupational exposures resulted in 107,000 deaths and 1,523,000 Disability Adjusted Life Years (DALYs). [2] In addition, several thousands of deaths can be attributed to other asbestos-related diseases, as well as to non-occupational exposures to asbestos.

There are six types of asbestos minerals, according to the Environmental Protection Agency (EPA): chrysotile, amosite, crocidolite, tremolite, anthophyllite and actinolite. Although all commercial forms of asbestos are carcinogenic, there are differences in their chemical compositions. [1,2,3,4]

**Chrysotile**-This is the most commercially used asbestos in the world accounting for more than 90% of world asbestos production. [5] Its fibers are curly and longer than other asbestos types. Many supporters of asbestos have argued that chrysotile isn't as toxic as other asbestos types, yet scientific studies confirm that it is extremely hazardous to human health. It is also known as white asbestos.

**Amosite**: It is primarily sourced in South Africa and is said to be more toxic than chrysotile. It often appears brown in color and its fibers are shorter and straighter than chrysotile fibers. It was most commonly used in construction products.

**Crocidolite**: It was less commonly used than other types of asbestos because it is not as resistant to heat as others. It is called blue asbestos, crocidolite's fibers are extremely thin, can penetrate human tissues easily and is considered the most harmful type of asbestos.

**Tremolite**: This mineral is commonly found alongside deposits of talc, vermiculite and chrysotile. This substance contaminated the infamous vermiculite mine in Libby, Montana. Vermiculite from that mine was installed in up to 35 million American homes in the form of Zonolite attic insulation, according to the U.S.EPA.

**Anthophyllite**: It is less commonly used than other asbestos deposits and was primarily mined in Finland, North Carolina and Georgia.

**Actinolite**: It consists of straight-shaped fibers, is normally dark in color and was commonly combined with vermiculite to make insulation. It was also used in construction materials such as paint.

Vermiculite is a type of mineral that when heated to a high temperature, expands as much as 8-30 times its original size. The expanded vermiculite is a light-weight, fire-resistant, and odorless material and has been used in numerous products, including insulation for attics and walls. Most vermiculite materials are usually contaminated with asbestos so the issue of abatement has to be considered. [1,2,3,4]

#### *Natural disasters and asbestos identification*

Natural disasters like volcanic eruptions, hurricanes, tornadoes, earthquakes are sources of asbestos emission. So soon after a natural disaster, these fibers may continue to circulate in the air, making them easily inhaled. Firefighters, law enforcement officials and cleanup crews are considered high-risk occupations for exposure after natural disasters. Homeowners of damaged properties also face these risks and should always use caution when cleaning or searching through debris. Each natural disaster presents a particular set of circumstances by which asbestos fibers can be released and inhaled or ingested. Hurricane Katrina in Louisiana and Mississippi, tornadoes in Alabama and Missouri, fires in California and flooding in Missouri and New Jersey from Hurricane Sandy are examples of natural disasters that officials feared exposed the public to asbestos. [4,6,7]

A fiber cannot be identified or ruled out as asbestos, either using the naked eye or by simply looking at a fiber under a regular microscope. The most common methods of identifying asbestos fibers are by using polarized light microscopy (PLM) or transmission electron microscopy (TEM). PLM is less expensive, but TEM is more precise and can be used at lower concentrations of asbestos. If

asbestos abatement is performed, completion of the abatement is verified using visual confirmation and may also involve air sampling. Air samples are typically analyzed using phase contrast microscopy (PCM). PCM involves counting fibers on a filter using a microscope. Airborne occupational exposure limits for asbestos are based on using the PCM method. The American Conference of Governmental Industrial Hygienists has a recommended Threshold Limit Value (TLV) for asbestos of 0.1 fibers/mL over an 8-hour shift. The Occupational Safety and Health Administration (OSHA) in the United States and occupational health and safety regulatory jurisdictions in Canada use 0.1 fibers/mL over an 8-hour shift as their exposure limits. [6,7]

#### *Health effects*

The National Institute of Occupational Safety and Health (NIOSH) data indicates substantial increase in asbestos-related deaths in the US from the 1960s to the 2000s and this trend is expected continue for several decades to come. [8,9] This is illustrated in Figure 1. [10] All types of asbestos cause lung cancer, mesothelioma, cancer of the larynx and ovary, and asbestosis (fibrosis of the lungs). Exposure to asbestos occurs through inhalation of fibers in air in the working environment, ambient air in the vicinity of point sources such as factories handling asbestos, or indoor air in housing and buildings containing friable (crumbly) asbestos materials.

Asbestosis is a clinical condition caused by exposure to asbestos due to accumulation of the fibers in lung tissues, setting the stage for long-term fibrosis (scarring). Because asbestosis is not a form of lung cancer or mesothelioma, people can live many years, even decades, with the disease. However, because the condition gets worse over time, patients will require increased treatment as they age.

An article by Mollo et al examined the criteria for attribution of lung cancers in Italy to asbestos exposure, suggesting that the number of asbestos-related lung cancers in Italy might be underestimated. Their review of 924 consecutive lobectomies and pneumonectomies for lung cancer in northwest Italy included light microscopic asbestos body counts for asbestos body concentration in addition to histologic examination for asbestosis and asbestos bodies. They suggested that 6% of the lung cancers in their series were attributable to asbestos exposure because of histologic diagnosis of asbestosis. [2]

While veterans in the US represent 8% of the nation's population, they comprise an astonishing 30% of all known mesothelioma deaths that have occurred in the country. [1,2,11]

A study found a correlation between the incidence of mesotheliomas and the distance a patient lived from known deposits of rock likely to include asbestos; by contrast, there was no correlation when the incidence of prostate cancer was compared with the same distances. The risk of mesothelioma declined by 6% for every 10 km (6.2 mi) that an individual had lived away from a likely asbestos source. [7] A study on the effect of early tobacco exposure and asbestos suggests that environmental tobacco smoke exposure (ETS) in utero alters the immune responses and leads to greater disease development after asbestos exposure, which is further exacerbated when exposure to ETS continues during early postnatal development. [12]

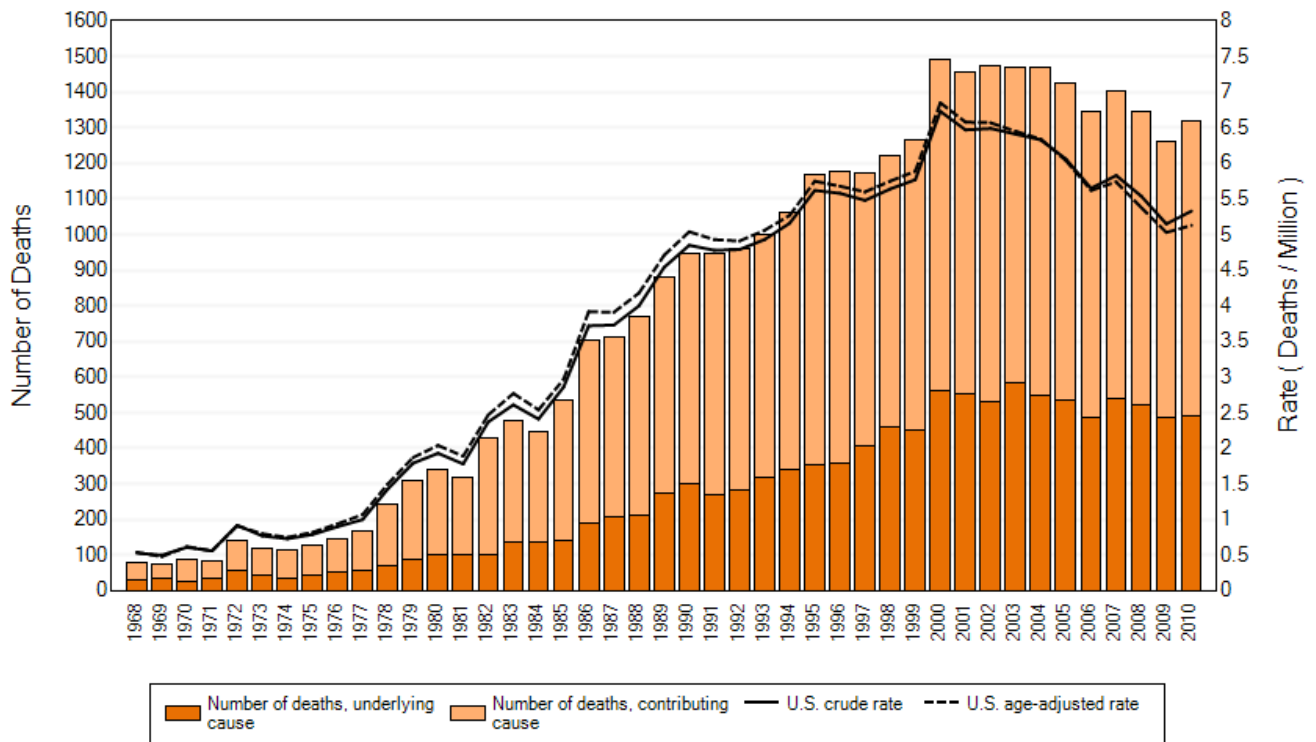


Figure 1. Asbestosis: Number of deaths, crude and age-adjusted death rates, U.S. residents age 15 and over, 1968–2010 [10]

*Rapid growth of asbestos industry*

The industrial revolution of late 1800s, gave asbestos mining sustained strong and steady growth. This coincided with the widespread commercial use of asbestos in myriads of applications. As the mining and manufacturing of asbestos exploded, so did its poisonous health effects on those who mined and refined the mineral, as well as those who used it. In the early part of the 19th century, crocidolite (blue asbestos) had already been found in Free State, Africa. In 1876, chrysotile (white asbestos) was discovered in Thetford Township, in southeastern Quebec. Shortly afterward, Canadians established the world's first commercial asbestos mines. They joined Russia in excavating the soft, fibrous form of the mineral, which is found in more than 95 percent of all asbestos products. Later industries sprang up in Scotland, Germany and England, Italy, South-Africa, Finland and Zimbabwe. [12,13,14,15]

*Gradual decline in asbestos use and introduction of substitutes*

Global demand for asbestos decreased after the liability claims against major asbestos manufacturers caused many of them to make and market asbestos substitutes, this is illustrated in Table 1 and Table 2. [5] By 2003, new environmental regulations and consumer demand helped push for full or partial bans on the use of asbestos in 17 countries: Argentina, Austria, Australia, Belgium, Chile, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Poland, Saudi Arabia, Sweden, Switzerland, and the United Kingdom. In 2005, asbestos was banned throughout the European Union. However, in recent years, many of the world's emerging economies have embraced the use of asbestos as eagerly as more developed nations did for much of the last century. [3,4,6,7]. Table 3 indicate a reluctance to decreasing use and production of asbestos in emerging economies. [16]

Table 1. World production of asbestos [5]

Year	Production (tonnes)
1963	2,922,000
1973	4,614,000
1978	5,159,000
1983	4,276,000
1988	4,323,000
1993	2,650,000
1994	2,410,000
1995	2,308,300(a)
1996	2,140,000 (a)

(a) Chrysolite only.

Table 2. Principal chrysotile consuming countries in 1994 [5]

Nations	Annual usage (tonnes)
China	220,000
Japan	195,000
Brazil	190,000
Thailand	164,000
India	123,000
South Korea	85,000
Iran	65,000
France	44,000
Indonesia	43,000
Mexico	38,000
Columbia	30,000
Spain	29,000
USA	29,000
Turkey	25,000
Malaysia	21,000
South Africa	20,000

Table 3. Asbestos production in developing countries (values in metric tons)\* [16]

Country	1995	1996	1997	1998	1999
Argentina**	300	446	400	380	350
Brazil**	170 000	170 000	170 000	170 000	170 000
China**	263 000	293 000	288 000	314 000	300 000
India	25 065	23 215	25 051	18 751	20 000
Iran**	4500	4500	4500	4500	4500
Swaziland	28 570	26 014	25 888	27 693	28 000
Zimbabwe	169 256	165 494	144 959	123 295	135 000
South Africa	88642	57 120	49 986	27 195	20 100
Egypt	427	1836	2000	2000	2000

\* From US Geological Survey, Year Book, 1999.

\*\* Estimated value.

#### *U.S. asbestos-cover up and Law.*

In the U.S, production of asbestos was not banned. It is still a legal commodity that appears in many building and common household products, but its use has declined considerably in the U.S. The last U.S. asbestos mine closed in 2002, ending more than a century of the country's asbestos production. Although the United States has historically provided only a small percentage of the world's supply, it was always the world's largest importer and consumer of asbestos. While evidence about the harmful effects of asbestos continued to grow, so did the influence of the asbestos companies. Between 1940 and 1980, the business expanded into a multibillion dollar industry that employed more than 200,000 people. [13,14]

The success of these asbestos companies hinged on keeping the health risks of asbestos a secret. It was asbestos workers and consumers who paid the price. In order to keep the industry alive and prosperous, many companies took steps to ensure miners, factory workers and the public knew nothing about the true dangers of asbestos. Court evidence revealed multiple companies that contributed to the asbestos cover-up. Medical research that may have promoted stricter asbestos regulations and safer work practices were concealed. Others worked their employees to an early grave, refusing to show sick workers their X-ray scans that showed signs of respiratory disease. [4,6]

Schools in the U.S. built before the 1980's had a lot of asbestos components which could be risky during maintenance work. According to the EPA, asbestos-containing materials reside in many of the approximately 132,000 primary and secondary schools in the nation. These schools serve more than 55 million children, and are the worksites for more than 7 million teachers, administrators and support staff. [6,7]

As long as asbestos building materials remain in good condition, the EPA insists they pose minimal health risks and recommends schools leave them in place. But if negligent maintenance work or improper abatement procedures occur, otherwise harmless asbestos products can cause serious health consequences. [7,13]

In the U.S the American Law Foundation amended tort law to make the sellers of dangerous materials liable to legal action unless they placed adequate warning labels on their products. Not surprisingly, few companies added labels until the law required it. Numerous mesothelioma

law suits started emerging. Plaintiffs who are directly exposed to asbestos, claimants who were injured by secondary exposure may be eligible for compensation. In order to bring a successful legal claim, they must be able to trace their exposure to a defendant who is liable for failure to warn or protect against the dangers. This usually involves investigating the work history of a family member who was exposed on the job. [13,14]

#### *Politics and controversies regarding asbestos*

Braun L et al, 2006 noted in their publication that South Africa was the third largest exporter of asbestos in the world for more than a century. As a consequence of the use, manufacturing, import and export of particularly exploitative social conditions, former workers and residents of mining regions suffered from the consequences of asbestos mining. Also the majority of workers were increasingly disenfranchised, excluded from skilled work, and predominantly rural. In addition, mining operations of the asbestos industry not only exposed workers to high levels of asbestos but also contaminated the environment extensively. [12,13,14,15] Russia was largest producer of asbestos and initially resisted the possibility of a ban or regulation of sale of asbestos to various nations. Researches on health effects of asbestos were suppressed. [14]

Even though the many harms of asbestos are well known to Americans, the toxic substance is still not banned from industrial use in the United States. Major asbestos companies bribed politicians with a lot of money so they can continue their trade<sup>10</sup>. However, asbestos was one of the first hazardous air pollutants regulated under Section 112 of the Clean Air Act of 1970, and many applications have been forbidden by the Toxic Substances Control Act (TSCA). [12,14,15,17]

Asbestos tragedy is ongoing and include the unscientific requirement for set numbers of asbestos bodies or fibers to be found in lung tissue in order to "prove" disease causation if lung specimen are available. Although the validity of such evidence has been discredited by independent scientists, it is still used as evidence by an influential US pathology department. [4,6] Frequently, epidemiological evidence regarding causal relationships and exposure histories is also often being ignored by insurance-affiliated medical experts. Also misleading arguments are currently being used in newly industrialized countries where white asbestos - which is

carcinogenic and fibrogenic like other asbestos types, is promoted as being less harmful. As a result, asbestos use is increasing in some of these countries because of economic interests at the expense of health of their people. [18]

Presently, controversies exist as to the specific carcinogenic thresholds for any of a large group of minerals consisting of the silicates of calcium, iron, magnesium, sodium, and aluminium usually in the form of long slender dark-coloured crystals (amphiboles) and chrysotile, the occupations that are truly at risk to develop malignant mesothelioma (MM) as a result of asbestos exposure, how to assign causation in individuals exposed to multiple industrial products containing variable concentrations of various asbestos fibers and what criteria should be used to accept causation in household exposure cases. The causation criteria currently acceptable in U.S. courts are surprisingly flexible and subject to variable interpretation by medical experts. [19,20] Also, Collegium Ramazzini Comments on the 2014 Helsinki consensus report on asbestos has challenged the use of presence of asbestos bodies in the lungs in diagnosis of asbestosis. [21] These controversies helped to introduce some politics in the regulation and ban of asbestos.

#### *Further International controversies and litigations*

International controversy exists regarding the perceived rights and wrongs associated with litigation on compensation claims related to asbestos exposure and alleged subsequent medical consequences. Asbestos is listed as a category of controlled waste under Annex I of the Basel Convention (1992) on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. [22,23,24] Specifically, any waste streams having asbestos (dust and fibers) as constituents are controlled (Item Y36). In general terms, Parties to the Convention are required to prohibit and not permit the export of hazardous wastes to the Parties which have prohibited the import of such wastes via the notification procedure in Article 13 of the Convention. [22,23,24] One of the major issues relating to asbestos in civil law suit is the latency of asbestos-related diseases. [23,24] Most countries have limitation periods to bar actions that are taken long after the cessation of exposure. [23,24] Asbestos litigation is the longest, most expensive mass tort in U.S. history, involving more than 8,000 defendants and 700,000 claimants. Current trends indicate that the rate at which people are diagnosed with the disease will likely increase through the next decade. Analysts have estimated that the total costs of asbestos litigation in the USA alone will eventually reach \$200 to \$275 billion. [23] *Asbestos in Africa*

As the Western governments outlawed asbestos use in their countries, the company manufacturing these fibers moved to Africa. In Nigeria in particular, it is being manufactured in many centrally located cities like Kano, Lagos and Sapele and promoted as an essential ingredient for building. Most houses in Nigeria today have asbestos as a major material, from roofing sheets to the pipes used for supposedly modern toilets. In fact, most Nigerians consider it a symbol of affluence that their homes are roofed entirely with asbestos roofing sheets as they are mostly ignorant of the negative consequences associated with asbestos use. [25] Sadly, the "Nigerian" companies involved in the manufacture of the product are all foreign

owned and the Government is silent concerning enacting laws to either regulate or out rightly ban the manufacture and use of asbestos in Nigeria. [25] South Africa banned the use, manufacturing, import and export of production of asbestos in 2008. Prior to this ban in south Africa, major asbestos companies like Everite debunked claims of the hazardous nature of asbestos until numerous law suits by victims brought them down. [15,24,25]

The objective of this study is to review previous publications on asbestos highlighting health effects and politics bordering its regulation. Another objective is to recommend measures to curtail the production, use and sale of asbestos especially in developing countries.

## 2. Methods

A systematic review to identify suitable studies from MEDLINE(via PubMed) and Electronic search through GOOGLE for original, review articles and documents on politics, law and health effects of asbestos. A total of 19 articles and online documents were finally selected and reviewed after screening out duplicates, those whose title and abstract did not capture relevant health, law and political issues related to asbestos regulation and those not consistent with the inclusion and exclusion criteria. All online documents and publications on asbestos not related to health, politics and laws were excluded from this study.

## 3. Results

The materials used in this review highlight the negative health impact of asbestos amongst workers, in homes and during natural disasters. Factors militating against effective regulation or ban of this hazardous substance in many counties include politics, economic gains, ignorance and unavailability of safe asbestos substitutes.

## 4. Discussion

The issue of Asbestos as a hazardous substance of public health concern has been debated for a long time and has led to the ban of this substance and its products in many countries e.g. France, Italy, New Zealand, Brazil, and Australia. While UK and USA have not banned its use, it is tightly regulated. India has not ban its use. In the US many litigation cases and politics are seen in the system as companies tend to hide the medical reports of early disease changes in their workers while some hide under the declaration of bankruptcy. The latency with asbestos related diseases has also been an issue in the courts. Listed as controlled wastes, many countries are regulated by the resolutions of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. This law should be tightened against offenders as many products contain asbestos and can be sold if constant surveillance is not in place. The role of medical experts as relates medical claims should be investigated due to controversies and arguments on diagnostic lesions related to occupationally related diseases. Manufacturers

should improve on diversification to alternative products that have similar and improved advantage over asbestos. The issue of safety of current alternative materials replacing asbestos should be researched also so as to gain public acceptance and assurance. Secrecy in industries concerning the medical records of workers should be discouraged and well spelled out compensation criteria should be put in place to assist workers. Areas where one may be exposed to asbestos should regularly be monitored by regulatory bodies for safety levels of asbestos in work places, homes and appliances so as to prevent or arrest possible exposures. Continuous research on safety levels and effects of asbestos in the environment on health should be given high priority.

The issue of abatement should be handled by reputable companies that can handle asbestos in a safe manner as many homes and schools still contain asbestos. Education of the public should be intensified on identification of possible asbestos containing compounds and how to avoid contamination. Politics of asbestos compensation should favor workers/victims because it is usually not a fault of theirs.

## 5. Recommendations

International efforts should be heightened to see to the stoppage of importation and exportation of this hazardous substance and its products. Developed countries should assist developing countries by transferring alternative technology and providing financial aid to help these developing countries transition away from asbestos. Developed countries should stop dumping hazardous wastes in developing countries as they don't have the technology to manage or destroy these wastes. This is simply a matter of international justice. Stiffer laws should be promulgated to deter would be offenders. An immediate actionable goal could be to place visible sign posts in places where asbestos is found and should be enforced as this will warn people to stay off such sites.

## 6. Conclusion

Though the production and sale of asbestos has declined in many developed countries, many low and middle income countries still trade in this hazardous substance. Politics still exists in asbestos trade despite the negative health impacts. Thus countries should recognize that the most efficient way to eliminate asbestos-related diseases is to stop the use of all types of asbestos by replacing asbestos with safer substitutes and developing economic and technological mechanisms to stimulate its replacement. Also measures should be taken to prevent exposure to asbestos during asbestos removal (abatement) and improving early diagnosis and treatment of asbestos-related disease and the social and medical rehabilitation of people affected by these diseases. We would advocate for the establishment of registries of people with past and/or current exposures to asbestos and the subsequent health outcomes. There should be continuous research to show the impact of asbestos in various societies where production, sale or use of this product still persists.

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## Conflict of Interest

All the authors have declared that they have no conflict of interest.

## Authors' Contributions

OAS conceptualized the study. RLM, AIZ and LCI made technical inputs in the conceptualization of the study. OAS and LC produced the first draft of the manuscript. RLM and AIZ contributed to editing of the final draft of the manuscript. All co-authors contributed in revising the manuscript and approved the final version for submission.

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