Introduction

One of the several reasons behind the cause of cancer is person's occupation. Approximately one third of life time during the age group of 20 to 60 years is spent at work place. Ones occupation exposes the person to various health issues recognized as occupational hazards. The spectrum of occupational hazards include chemical hazard, biological hazard, physical hazard, adverse ergonomic conditions, allegories, safety issues, psychological hazards, injuries, hearing loss, respiratory hazards, cardiovascular hazard, reproductive hazards, neurological hazards, skin hazards and the last but not the least is Occupational Cancers.

History

Chimney sweeper's cancer - Sir Percivall Pott, an English surgeon found that chimney sweepers especially those who were working from childhood were found to have a peculiar type of skin cancer of scrotum. He found the association between carbon soot and squamous cell carcinoma of scrotal skin in 1775. This was the first ever reported occupational cancer in the medical literature. The impact of this association was so much that it lead to formation of Chimney Sweeps in 1778 in UK which prohibited children to work as chimney sweepers.

Mule spinner's cancer - During 1900, it was found that there is high incidence of scrotum cancer in mule spinner workers. In 1926, a British Home Office committee strongly favored the view that this form of cancer was caused by the prolonged action of mineral oils on the skin of the scrotum, and of these oils, shale oil was deemed to be the most carcinogenic. From 1911 to 1938, there were 500 deaths amongst cotton mule-spinners from cancer of the scrotum.

Radium girls - The female factory workers who contracted radiation poisoning from painting watch dials with self-luminous paint. The women in the work plant were told that the paint was harmless, and subsequently ingested deadly amounts of radium after being instructed to "point" their brushes on their lips in order to give them a fine point. Some also painted their fingernails, face and teeth with the glowing substance. Osteosarcoma of jaw bones was reported in these girls due to radiation exposure from the radioactive radium.

Epidemiology

The incidence of occupational cancer is reported in the developed countries like the USA is 48000 cancers per year which amounts for 4-10% of all cancers. The data from UK shows the proportion of occupational cancers to be 8% of all cancers. No systematic information is available on occupational cancer incidence in India. The Global Occupational Health Network [GOHNET] of World Health Organization [WHO] reports the worldwide estimate of occupational cancers to be 4-20% of all cancers. Occupational cancer results in 1.4 million of disability-adjusted life-years (DALYs), primarily in countries from the Western Pacific and Europe, followed by South-East Asia and the America.

Carcinogens and occupation cancers

The International Agency for Research of Cancer [IARC] association with WHO has categorized the carcinogens – cancer causing agents – into 5 groups as described in table 1.

| Group 1 | Carcinogenic to humans |
| Group 2A | Probably carcinogenic to humans |
| Group 2B | Possibly carcinogenic to humans |
| Group 3 | Not classifiable as to its carcinogenicity to humans |
| Group 4 | Probably not carcinogenic to humans |

The common occupational cancer and their etiological agents are described in the table 2.

<table>
<thead>
<tr>
<th>Cancer</th>
<th>Attributable Risk</th>
<th>Carcinogenic Agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung cancer</td>
<td>6.3-15.0%</td>
<td>Asbestos; silica; nickel; indoor radon; diesel fumes; environmental tobacco smoke (ETS) at workplaces; production and refining of arsenic, beryllium, cadmium, aluminium and chromium; mining of uranium; copper smelting; iron and steel foundry; weaving workers; painters.</td>
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<tr>
<td>Bladder cancer</td>
<td>7-19%</td>
<td>2-naphthylamine; benzidine; 4-aminodiphenyl ( \rightarrow ) manufacturing of: magenta, auremine, ( \rightarrow ) chloro-toluidine, pigment chrome, and dyes; spray painting; latex production; tire curing; calendar operations; reclaim, cable makers, gas-retort workers.</td>
</tr>
<tr>
<td>Mesothelioma</td>
<td>85-90%</td>
<td>Asbestos</td>
</tr>
<tr>
<td>Skin cancer</td>
<td>1.5-6.0%</td>
<td>Intensive solar radiation; coal-tar pitch; coal tar; shale oils; arsenic; mineral oils; polycyclic aromatic hydrocarbons (PAH); production of coke; workers; fishermen.</td>
</tr>
<tr>
<td>Larynx cancer</td>
<td>1.5-20.0%</td>
<td>Sulfuric acid, mineral oils and asbestos, painters operations.</td>
</tr>
<tr>
<td>Liver cancer</td>
<td>0.4-1.0%</td>
<td>Vinyl chloride; occupational infections hepatitis B and C, health care workers.</td>
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<tr>
<td>Sinonasal cancer</td>
<td>33-46%</td>
<td>Wood dust; nickel compounds; hexamethylene; chromium; boot and shoe manufacturing and repair; manufacturing of isopropanol using washing process; furniture and cabinet making; paraphormaldehyde.</td>
</tr>
</tbody>
</table>
The various factors attributed for the risk of developing an occupation cancer are as follows:
- Dose of carcinogen exposed
- Duration of exposure
- Route of exposure
- Individual susceptibility
- Personal habits - addictions like smoking, alcohol etc.

**Prevention**

Occupational Cancer Convention [C139], 1974 by the International Labour Organization [ILO] requires ratifying countries to:
- Periodically determine the carcinogenic substances and agents to which occupational exposure shall be prohibited or made subject to authorization and control
- Make every effort to replace carcinogenic substances and agents with non-carcinogenic and less harmful ones
- Take measures to reduce the minimum the number of workers exposed to carcinogenic substances, and the duration and degree of exposure and to establish an appropriate system of records
- Ensure that workers who have been or likely to be exposed to carcinogens, are provided with information on dangers and relevant preventive measures
- Organize medical surveillance of workers at risk during and after employment.

**Night shift and breast cancer**

A recent study published in January 2018 has shown strong relationship between night shift workers and breast cancer incidence. In North America and Europe, working the night shift was associated with a 32% increased risk for breast cancer overall (odds ratio [OR] = 1.316). But the risk was even higher in one specific group: Night nurses were found to have a "remarkable" 58% increased risk (OR = 1.577) for breast cancer. For every 5 years a woman spent working nights, breast cancer risk increased by 3.3% (OR = 1.033). Melatonin shows potential oncostatic action, and light exposure during night suppresses melatonin production.

**Aircraft pilot and cabin crew and cancer**

Approximately 4,40,000 persons work onboard in civil aircrafts worldwide. There is increased radiation exposure during the long hours spent at high altitudes, exposure to carbon monoxide and jet exhaust, and frequent disruptions in circadian rhythm. The highest radiation doses occur at high altitudes and in polar flight routes. Short-haul flights involve lower doses than long-haul flights, and so does traveling in propeller-driven aircraft relative to jet aircraft. The overall mortality from skin cancer (for malignant melanoma, Standardized Mortality Ratio = 1.93, 95% CI: 0.70, 4.44) among male cabin crew was increased.

**Conclusion**

Most of us spend our 1/3rd of lifespan at our workplace which has direct impact on our health. Occupational cancer is one of the most serious occupational hazards accounting for up to 20% of all cancers. Awareness, safety measures and regulations are necessary to reduce the burden of mortality and morbidity of the avoidable occupational cancers.

**Picture 1** - Chimney sweeps and scrotal cancer

**Picture 2** - Mule spinners cancer

**Picture 3** - Radium girl and jaw osteosarcoma