The Consequence of Smoking & Health Benefits of Quitting

Smoking is the leading cause of preventable ill health and premature mortality\(^1,2\). There are an estimated 1.3 billion smokers worldwide\(^3\). In South Africa alone, there are an estimated 7 million smokers\(^3\).

Every year over 5 million deaths are attributed to tobacco smoking\(^3\), equating to 12% of all adult deaths worldwide\(^9\).

**WHAT EFFECT DOES SMOKING HAVE ON HEALTH?**\(^2,5\)

The main ingredient in cigarettes is tobacco which contains a deadly mix of more than 7,000 chemicals; 250 of which are harmful, and at least 69 are known to cause cancer\(^4,6\).

1. Cigarette smoking accounts for about one-third of all cancers, including 90 percent of lung cancer cases. Smokeless tobacco (such as chewing tobacco and snuff) increases the risk of oral cancers\(^6,12,13\).
2. Smoking causes lung diseases such as chronic bronchitis and emphysema\(^6,12,13\).
3. Smoking increases the risk of heart disease, including stroke, heart attack, vascular disease, and aneurysm\(^2,6\).
4. Smoking has been linked to leukemia, blindness, cataracts, and pneumonia\(^6\).
5. On average, adults who smoke die 10 years earlier than nonsmokers\(^5,6\).
6. Smoking causes osteoporosis, periodontitis and hip fractures\(^5\).
7. Smoking can result in infertility and impotence\(^5,6\).

**SMOKING DURING PREGNANCY**

Pregnant women who smoke cigarettes run an increased risk of miscarriage, stillborn or premature infants, or infants with low birthweight\(^5,7\). Maternal smoking may also be associated with learning and behavioural problems in children\(^7\). Smoking more than one pack of cigarettes per day during pregnancy nearly doubles the risk that the affected child will become addicted to tobacco if that child starts smoking\(^7\).

**SECONDARY SMOKING**

While we often think of medical consequences that result from direct use of tobacco products, passive or secondary smoke also increases the risk for many diseases\(^8\). Secondhand smoke, also known as
environmental tobacco smoke, consists of exhaled smoke and smoke given off by the burning end of tobacco products.

The harmful effects of smoking extend far beyond the smoker. Exposure to secondhand smoke can cause serious diseases and results in the deaths of more than 53,000 every year\(^8\). Nonsmokers exposed to secondhand smoke at home or work increase their risk of developing heart disease by 25-30% and lung cancer by 20-30%\(^{13}\). In addition, secondhand smoke causes health problems in both adults and children, such as coughing, overproduction of phlegm, reduced lung function and respiratory infections, including pneumonia and bronchitis.

The effects of secondary smoking on children
- Each year about 150,000–300,000 children younger than 18 months old experience respiratory tract infections caused by secondhand smoke\(^8\).
- Children exposed to secondhand smoke are at an increased risk of ear infections, severe asthma, respiratory infections and death\(^8\).
- More than 100,000 babies have died in the past 50 years from sudden infant death syndrome (SIDS), and other health complications as a result of parental smoking\(^9\).
- Children who grow up with parents who smoke are more likely to become smokers, thus placing themselves (and their future families) at risk for the same health problems as their parents when they become adults\(^8\).

HOW DOES SMOKING AFFECT THE BRAIN?

Cigarettes and other forms of tobacco—including cigars, pipe tobacco, snuff, and chewing tobacco—contain the addictive drug nicotine\(^4\).

Steady exposure to nicotine causes the brain to develop extra nicotine receptors to accommodate the large doses of nicotine from tobacco\(^10\). Upon entering the bloodstream, nicotine immediately stimulates the adrenal glands to release the hormone epinephrine (adrenaline)\(^10\). Epinephrine stimulates the central nervous system and increases blood pressure, respiration, and heart rate\(^10\).

Nicotine is readily absorbed into the bloodstream when a tobacco product is chewed, inhaled, or smoked. A typical smoker will take 10 puffs on a cigarette over a period of 5 minutes. Thus, a person who smokes 1 pack (25 cigarettes) daily gets 250 “hits” of nicotine each day\(^10\).

Most smokers become addicted to nicotine. Research suggests that nicotine may be as addictive as heroin, cocaine, or alcohol\(^6,11,12\).

Similar to cocaine and heroin, nicotine increases levels of the neurotransmitter dopamine, which affects the brain pathways that control reward and pleasure\(^11\). For many tobacco users, long-term brain changes induced by continued nicotine exposure result in addiction—a condition of compulsive drug seeking and use, even in the face of negative consequences. Studies suggest that additional compounds in tobacco smoke, such as acetaldehyde, may enhance nicotine’s effects on the brain\(^10,17\).

Some of the chemicals contained in tobacco smoke\(^2,12\).
Are they safe?
Although e-cigarette vapor does not contain tar which is responsible for most lung cancer and other respiratory diseases, it has been shown to contain known carcinogens and toxic chemicals (such as formaldehyde and acetaldehyde), as well as potentially toxic metal nanoparticles from the vaporising mechanism. There is currently no way of confirming how safe they are or the associated long term health consequences they may carry\textsuperscript{15,14}.

E-cigarettes contain nicotine derived from tobacco and as such, are subject to the same government regulations as tobacco products. Similarly, all in-store and online purchasers are required to be at least 18 years old\textsuperscript{21}.

Can they help people quit traditional cigarettes?
E-cigarettes are thought by many to be a safer alternative to conventional cigarettes, and are thought to help smokers lower nicotine cravings while they are trying to quit smoking. However, studies of the effectiveness of e-cigarettes have not confirmed that they aid with smoking cessation. On the contrary, it has been suggested that they may perpetuate the nicotine addiction and could in fact, interfere with quitting smoking\textsuperscript{15,14}.

Initial studies conducted suggest that e-cigarettes may not only put users at risk for nicotine addiction but also serve as an introduction to nicotine which could lead to use of regular cigarettes and other tobacco products. A recent study showed that high school students who use e-cigarettes are more likely than others to start smoking traditional cigarettes and other smokeable tobacco products within the next year\textsuperscript{21,14}.

QUITTING
Nearly 7 out of every 10 (68.0\%) cigarette smokers in the US reported that they wanted to quit completely in 2015\textsuperscript{15}.

People who stop smoking greatly reduce their risk for disease and early death\textsuperscript{6} – a 35 year old man who quits smoking will, on average, increase his life expectancy by 5 years\textsuperscript{5}. Although the health benefits are greater for people who stop at earlier ages, there are benefits at any age\textsuperscript{6,12,16}.

\textbf{The immediate and long term benefits of quitting\textsuperscript{4}}

<table>
<thead>
<tr>
<th>Time since quitting</th>
<th>Beneficial health changes that take place</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within 20 minutes</td>
<td>Your heart rate and blood pressure drop</td>
</tr>
<tr>
<td>12 hours</td>
<td>The carbon monoxide level in your blood drops to normal</td>
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<tr>
<td>2-12 weeks</td>
<td>Your circulation improves and your lung function increases</td>
</tr>
<tr>
<td>1-9 months</td>
<td>Coughing and shortness of breath decrease</td>
</tr>
<tr>
<td>1 year</td>
<td>Your risk of coronary heart disease is about half that of a smoker</td>
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<tr>
<td>5 years</td>
<td>Your stroke risk is reduced to that of a non-smoker 5 to 15 years after quitting</td>
</tr>
<tr>
<td>10 years</td>
<td>Your risk of lung cancer falls to about half that of a smoker and your risk of cancer of the mouth, throat, esophagus, bladder, cervix, and pancreas decreases</td>
</tr>
<tr>
<td>15 years</td>
<td>The risk of coronary heart disease is that of a non-smoker’s</td>
</tr>
</tbody>
</table>

\textbf{THE HEALTH BENEFITS OF QUITTING\textsuperscript{6,12,14,16}}

\begin{itemize}
  \item A lower risk of getting lung cancer and other types of cancer
  \item The reduced risk of contracting heart disease, stroke and peripheral vascular disease (the narrowing of blood vessels outside your heart)
  \item Respiratory symptoms such as coughing, wheezing and shortness of breath disappear or do not progress at the same rate as in persons who do not quit smoking
  \item Reduced risk of developing chronic obstructive pulmonary disease, also known as COPD, one of the leading causes of death in the United States, and other lung diseases
  \item A reduced risk of infertility in women of childbearing age as well as a reduced risk of giving birth to a low birth weight baby
\end{itemize}
HOW TO QUIT

It is important to realise that tobacco addiction is a chronic disease and that ceasing the addiction may involve some difficulties. When an addict tries to quit, they may experience some of the following withdrawal symptoms:

- Irritability
- Attention difficulties
- Sleep disturbances
- Increased appetite
- Powerful cravings for tobacco

These symptoms cause many smoking addicts to abandon their decision to quit, and result in multiple attempts to quit.

TREATMENTS TO ASSIST WITH QUITTING

Most smoking addicts attempt to quit without making use of the supporting treatments that are available to them. There are a number of treatments that can help smokers manage withdrawal symptoms. Research shows that smokers who adopt any of the following treatments, are more likely to quit successfully:

Consult a doctor
Chat briefly with your doctor who can offer guidance about resources and tools which can assist with quitting.

Medication proven to be effective for quitting
Nicotine replacement products (NRTs) deliver a controlled dose of nicotine to a smoker in order to relieve withdrawal symptoms during the smoking cessation process.
- Over-the-counter treatments such as nicotine chewing gum, the nicotine patch, nasal sprays, inhalers, and lozenges
- Prescription treatments such as nicotine patches, inhalers and nasal sprays

Other medications
Regulatory Authority approved prescription non-nicotine medications such as bupropion SR (Zyban®), varenicline tartrate (Champix®), targets nicotine receptors in the brain, easing withdrawal symptoms and blocking the effects of nicotine if people resume smoking.

Behavioural treatments
Behavioural treatments employ a variety of methods to help smokers quit and teach them to recognise high-risk situations and develop coping strategies. These include:
- Self-help materials
- Counseling: one-on-one, group or telephonic counselling
- Training in problem solving

Mobile phone smoking cessation programmes
Mobile phone technology is used to provide personalised smoking cessation support.

Motivational messages and behaviour-change methods used in face-to-face smoking cessation support are modified for delivery via mobile phones with the content tailored to the age, sex, and ethnic group of the quitter. In this way, support can be delivered wherever the person is located, without them having to attend services, and can be interactive, allowing quitters to obtain extra help when needed.

Both medication and behavioral interventions (counseling) can help smokers quit; but the combination of the two approaches is more effective than either alone.

ONGOING RESEARCH

Scientists are currently developing new quitting smoking therapies and are working on a nicotine vaccine, which would block the reinforcing effects of nicotine by causing the immune system to bind to drug in the bloodstream and prevent it from reaching the brain.

There are also studies being conducted which investigate the effect of using multiple nicotine replacement medications at the same time, to target several relapse symptoms such as withdrawal, craving and depression simultaneously.

Smoking ‘Leaves Footprints on Our DNA’
- Peter Russell
23 September 2016

Smoking cigarettes can alter genes and may have a long lasting effect on our DNA, according to new research. The study in ‘Circulation: Cardiovascular Genetics’ could cast new light on why smoking increases the risk of so many diseases.

The US researchers investigated how tobacco use can trigger a process known as DNA methylation which has previously been linked to the development of coronary heart disease.

Turning Genes On and Off
“These results are important because methylation, as one of the mechanisms of the regulation of gene expression, affects what genes are turned on, which has implications for the development of smoking related diseases,” says coauthor Dr. Stephanie London from the National Institutes of Health in North Carolina. “Equally important is our finding that even after someone stops smoking, we still see the effects of smoking on their DNA.”

The researchers compared blood samples from 15,907 people who were either smokers, former smokers or people who had never smoked. They found that: Smoking related methylation was associated with more than 7,000 genes, or one third of known human genes. In former smokers, the majority of DNA methylation sites returned to
levels seen in those who had never smoked within 5 years of quitting smoking. Some people showed signs of DNA methylation 30 years after quitting smoking.

**Heart Disease and Cancers**

The study also revealed that the most statistically significant methylation sites were linked to genes associated with a number of smoking related diseases including heart disease and some cancers. Coauthor Roby Joehanes from Harvard Medical School in Boston says in a statement: “Our study has found compelling evidence that smoking has a long-lasting impact on our molecular machinery, an impact that can last more than 30 years. The encouraging news is that once you stop smoking, the majority of DNA methylation signals return to never smoker levels after 5 years, which means your body is trying to heal itself of the harmful impacts of tobacco smoking.” The researchers say their findings may contribute to future treatments that could be targeted at DNA methylation sites.

**Smoking: ‘Better Not to Start’**

Commenting on the findings in an emailed statement, Professor Jeremy Pearson, associate medical director at the British Heart Foundation, says: “Epigenetics – the science seeking to understand how our environment affects the ways our genes are switched on and off” is an exciting new research field. Research funded by the BHF in this area is helping us to better understand how the environment affects the development of heart disease.

“"This large and well performed study extends previous findings that smoking leads to modifications in DNA, by showing that while many of these changes are reversible, some are very long lasting and may affect risk of future disease even though the person has stopped smoking. "It further emphasises the point that while giving up smoking is a very important way to reduce risk of serious disease, it is even better to not start at all.”

**REFERENCES:**

1. JHa P. Avoidable deaths from smoking: a global perspective. Public Health Rev 2012; 33: 569-600