

SMOKING AND PERIODONTAL DISEASE

Dr Pradeep

Dr Anna Hughes

Dr Tina Choo

Ass Prof Leticia A. Miranda





SMOKING STATS & FACTS

- America – 12.5 % of adults (31 M)
- America – 400K or 1/5 deaths
- Europe–26.4% of adults
- *Australia – 23% of adults (3.5M) smokers (NHS survey 2004-2005)*
- Now 13.6% in Australia, cost now \$25+
- More Men vs women
- Contributes to 1/3 of cancer deaths
- in 2015, nearly 21,000 deaths in Australia were attributable directly to tobacco smoking



A Global Perspective

- As many as 6.25 trillion **cigarettes** are smoked annually across the globe.⁹⁵
- Tobacco kills 6 million people each year.¹⁴²
- Only 30% of the world's population have access to **smoking cessation** services.¹⁴⁴
- Only 22% of the world's population are protected by smoke-free laws.¹⁴⁴

WHAT IS IN A CIGARETTE?



- Over 4000 chemicals
- Over **60 potentially toxic carcinogens**: CO, hydrogen cyanide, reactive oxidizing radicals, nicotine, Tar- a chemical substance that occurs when tobacco is burnt
- Nicotine is the addictive part– physical effects similar to caffeine.
- Stimulant, increase BP & vasoconstriction
- Dangerous combination

- 
- Nicotine, which is an alkaloid, is found within the tobacco leaf and evaporates when the cigarette is lighted.
 - It is quickly absorbed in the lungs, and it reaches the brain within 10 to 19 seconds.
 - Nicotine is highly addictive. It causes a rise in blood pressure, increased heart and respiratory rates, and peripheral vasoconstriction.

- Biochemical tests can also be used to assess smoking status, **including exhaled carbon monoxide** and the measurement of **cotinine (the major metabolite of nicotine)** in serum, saliva, or urine.
- Cotinine is measured in preference to nicotine because the half-life of nicotine is short (≈ 1 to 2 hours), **whereas that of cotinine is approximately 20 hours**.
- Plasma and **saliva cotinine** concentrations in smokers are approximately **100 ng/mL** and the **urine concentration is approximately 1200 ng/ mL**.
- Nonsmokers usually have plasma and saliva cotinine concentrations of **less than 2 ng/mL**, unless they are passive smokers.

TYPES OF TOBACCO

- Cigarettes
- Pipe smokers
- Cigar smokers
- Pouches
- Betel nut chewing
- Shisha
- Snus- smokeless , available in Scan, banned in Europe Sweden has lowest rate of tobacco related mortality, inc lung cancer.



There are two main types, wood and chewing tobacco.

DRY SNIFF
Powdered tobacco inhaled through the nose at least daily. Misdiagnosed as a dry sniff has declined since 1990. (JGIM 1999; 14:1024)

Producers' interests reflected through the issue of federal estate. Midpoint east of by staff has declined since 1990. (2000)



Should always hold in the mouth between the chest and gum. Some mouth is wrapped into mouth paper or in packets. Other most mouth pieces are worn at mouth, neck, throat, chest, or under.



Intense smoking involves burning dried or cured leaves of tobacco plants and inhaling the smoke. Continuous release of toxic compounds in tobacco such as nicotine and tar, carcinogens which are absorbed through the lungs.

MANUFACTURED
CIGARETTES

The main swimming pool features a great first period of playtime or second-half warm-up, provided with multiple of other pool activities and called out to play. The pool is a valuable space that, like any other, can be used to create a more



Full-year 1999 RTO cigarettes are found to be less than one-half as toxic as cigarettes rolled in a cigarette paper. RTO smokers inhale high concentrations of tar, nicotine and nitrosamines and are at increased risk of cancers of the mouth, throat and lung.



ing behavior. The
use of words like
"we" and "us" in
the strategy is
crucial. The most
important product is
the company's ability

Substrates, following an incubation period, are placed in the mouth of a rat by a grid holding (chipped) or (chewed). After being released, substrate passes up the trachea and substrate passes out of the mouth. Substrate includes: drug, tissue, food, or water.

[illegible]

compared to those in a
 reduced higher levels of
 education that suggests
 a charitable and phony
 that and it is good for
 and I will give you

PIPES

of experience, flow through the water, a structure and look



and as usually, through, through, or both. Indicate whether it is a primary level, too. The grade is listed by the other hand and measured through a hole and hole. With the arrow, the arrow, the

The image displays 16 different tobacco products arranged in a grid-like fashion, each with a label underneath:

- Kiwam**: A dark, irregular, chunky mass.
- Zarda**: A pile of small, light brown, flake-like particles.
- Gutka**: A pile of small, light-colored, irregular pieces.
- Moist snuff**: A dark, finely ground powder.
- Dry snuff**: A pile of light brown, finely ground powder.
- Snus**: A small, white, rectangular stick and a pile of dark brown granules.
- Chimó**: A dark, irregular, chunky mass.
- Moist snuff (caffeinated)**: A pile of dark, irregular, chunky pieces.
- Plug**: A rectangular, dark, textured block.
- Nasway**: A pile of small, light brown, cylindrical pieces.
- Toombak**: A pile of dark, irregular, chunky pieces.
- Twist**: A long, dark, twisted rope-like object.
- Red toothpowder**: A pile of bright red, finely ground powder.
- Shammah**: A pile of light brown, finely ground powder.
- Orbs**: A small, light brown, spherical object.
- Strips**: A small, dark, rectangular piece.
- Sticks**: A long, dark, cylindrical stick.
- Tobacco-coated toothpicks**: A long, dark, cylindrical stick with a lighter tip.
- Mawa**: A pile of dark, irregular, chunky pieces.
- Rapé**: A pile of green, finely ground powder.

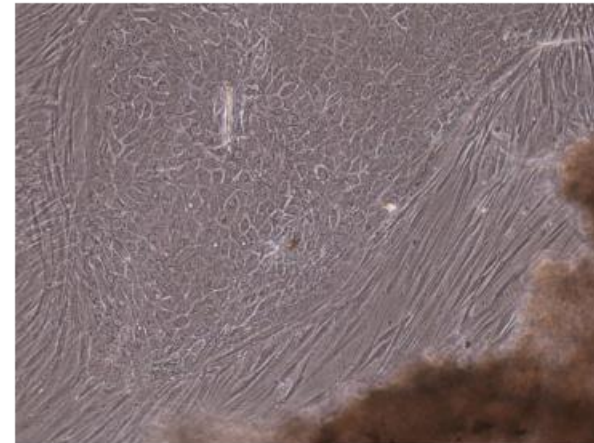
The use of tobacco is associated with a range of different diseases, contributing to the burden of nine disease groups. Below are the estimated percentages of the burden attributable to tobacco use for different disease groups, in 2015¹⁶:

- 41% of respiratory diseases
- 22% of cancers
- 12% of cardiovascular diseases
- 7% of infections
- 4% of endocrine disorders

Effect on host

LOCAL and SYSTEMIC

- Temperature and gases effect
- Vasoconstriction
- Microvasculature
- Fibroblast function
- Neutrophils
- Cytokines
- IgG reduced
- Adhesion molecules



DOES SMOKING INCREASE THE RISK FOR GUM DISEASE?

- Previous epidemiological studies – smoking is a significant risk factor for the development of periodontal diseases
- Smokers have deeper PD, more deep pockets, more gingival recession, bone loss, more teeth with furcation involvement, more tooth loss, less gingivitis & less BOP
- Smokers & Former smokers have more periodontitis than NS
- 40% of Chronic Periodontitis cases may be due to smoking
- Link between passive smoking and periodontitis



DOES SMOKING INCREASE THE RISK FOR GUM DISEASE?

- Effect is dose dependent: daily use, quantity & duration
- Require a certain level of tobacco use
- OR for severe attachment loss:
 - OR 2 light smokers vs NS
 - OR 4.75 in heavy smokers vs NS
- * Light (<10cigs/day)
- * Heavy (>30 cigs/day)



HOW DOES SMOKING INCREASE THE RISK FOR GUM DISEASE?

- Previously believed it was due to more plaque formation --> more severe periodontitis
- Current data suggest not



SMOKERS vs NON SMOKERS

In general, smokers present:

- Increased amounts of plaque and calculus (Bergstrom et al 1986 e 2005)
- LESS gingivitis and LESS BOP (Haffajee et al 2001)
- Deeper probing depths and increased number of sites with deeper probing depths (Bergstrom et al 2000)
- More attachment loss & recession (Haffajee et al 2001)
- More alveolar bone loss (Grossi et al 1995)
- More tooth loss (Krall et al 1997)
- More furcation involved teeth (Mullaly et al 1996)

HOW DOES SMOKING INCREASE THE RISK FOR GUM DISEASE?

Effect on Oral Flora Bacteria

- Tobacco smoke contains carbon monoxide (CO)
- CO lowers O₂ – favour growth of anaerobic bacteria, even in shallower pockets <5mm
- Favorable habitat for periopathogens (Aa, Pg)
- Maxillary teeth, upper & lower incisors. Palatal areas
- Some studies show no difference -inconsistent data on how smoking affects periodontal microbiome



- On average, **smokers were four times** as likely to have periodontitis as compared with never smokers after adjusting for age, gender, race/ethnicity, education, and income/poverty ratio.
- **Former smokers were 1.7 times** more likely to have periodontitis than persons who had never smoked.
- This study also demonstrated a dose-response relationship between cigarettes smoked per day and the odds of having periodontitis.
- In subjects **smoking 9 or fewer cigarettes** per day, the odds of having periodontitis were **2.8**, whereas subjects who **smoked 31 or more cigarettes per day were almost six times** more likely to have periodontitis.
- **In former smokers**, the odds of having periodontitis **declined** with the number of years since quitting

WHY DOES SMOKING INCREASE THE RISK FOR GUM DISEASE?

Effect on gingival blood vessels

- Less redness & BOP
- Dose dependent
- Nicotine –
Vasoconstrictive
- Fewer blood vessels



Clinical appearance in smoker

- Fibrotic 'tight' gingiva, rolled margins
- Less gingival redness and bleeding
- More severe, widespread disease than same age non-smoking control
- Anterior, maxilla, palate are worst areas affected
- Anterior recession, open embrasures
- Nicotine staining
- Calculus

(a)

Clinical characteristics of smoker

- Relatively earlier onset
- Rapid disease progression
- Greater severity and extent of disease (pockets, clinical attachment loss, bone loss)
- More tooth loss
- Poorer response to non-surgical therapy
- Recurrence within 1 year of surgery – ?avoid surgery
- Increased % are refractory to treatment

(b)

Figure 36.2 Details of clinical appearance and characteristics in a smoker.

Less gingivitis and BOP

- Bleeding index non-compatible with amounts of plaque and calculus
- Reduced bleeding due to vasoconstriction and reduced number of vessels in the gingiva of smokers
- Fibrotic gingiva with less edema





Fig. 11-8 Clinical appearance of a 53-year-old male patient who reports smoking one pack a day for 35 years. (a) Anterior view; (b) palatal view of the maxillary anterior teeth, and (c) lingual view of the mandibular anterior teeth. Note the heavy staining. Periodontal examination revealed probing depths of up to 9mm, gingival recessions, and furcation involvements at all molars. (Source: Courtesy of Dr. Matthew Hickin.)

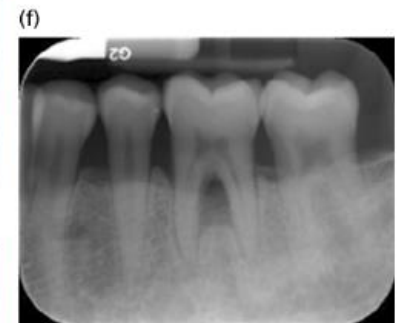
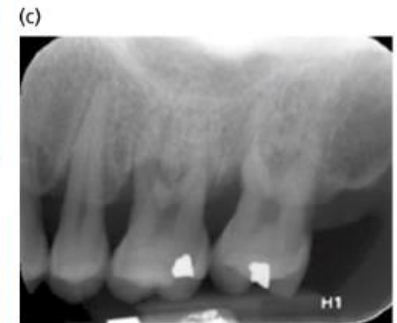


Fig. 11-9 Same patient as in Fig. 11-8. (a, b) Maxillary left buccal and palatal views and (c) corresponding radiograph; (d, e) mandibular left buccal and lingual views and (f) corresponding radiograph. Heavy staining and advanced bone loss are apparent. (Source: Courtesy of Dr. Matthew Hickin.)

WHY DOES SMOKING INCREASE THE RISK FOR GUM DISEASE?

Effect on host response- both innate and immune response affected

- Effect depend on duration & dose
- Impaired healing response & enhanced destruction
- Less neutrophils (PMNs) migrate into GCF& pocket
- Nicotine - PMNs produce more MMPs, impaired phagocytosis & chemotaxis
- PMNs - more inflammatory mediators released in response to bacteria
- Reduced fibroblast proliferation, migration, matrix production & attachment to root surface
- B cell function impaired - reduced levels of antibodies produced

TABLE 23.1 Effects of Smoking on Gingivitis and Periodontitis

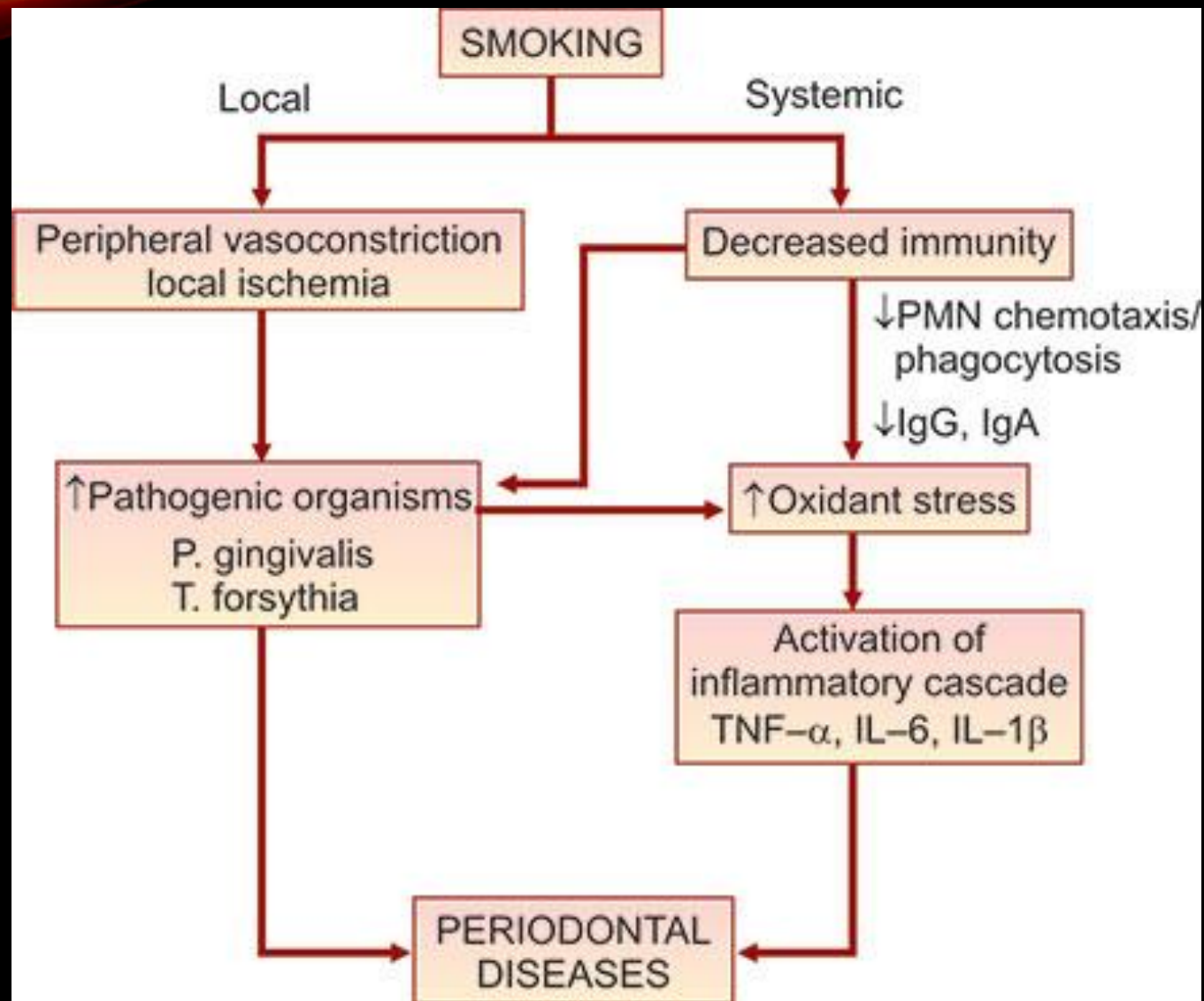
Periodontal Disease	Effects of Smoking
Gingivitis	↓ Gingival inflammation and bleeding on probing
Periodontitis	↑ Prevalence and severity of periodontal destruction ↑ Pocket depth, attachment loss, and bone loss ↑ Rate of periodontal destruction ↑ Prevalence of severe periodontitis ↑ Tooth loss ↑ Prevalence with increased number of cigarettes smoked per day ↓ Prevalence and severity with smoking cessation

↓, Decreased; ↑, increased.

TABLE 23.3 Effects of Smoking on the Etiology and Pathogenesis of Periodontal Disease

Etiologic Factor	Effects of Smoking
Microbiology	Increased complexity of the microbiome and colonization of periodontal pockets by periodontal pathogens
Immune— inflammatory response	Altered neutrophil chemotaxis, phagocytosis, and oxidative burst ↑ Tumor necrosis factor-α and prostaglandin E₂ in gingival crevicular fluid ↑ Neutrophil collagenase and elastase in gingival crevicular fluid ↑ Production of prostaglandin E₂ by monocytes in response to lipopolysaccharide
Physiology	↓ Gingival blood vessels with ↑ inflammation ↓ Gingival crevicular fluid flow and bleeding on probing with ↑ inflammation ↓ Subgingival temperature ↑ Time needed to recover from local anesthesia

↓, Decreased; ↑, increased.



HOW DOES SMOKING AFFECT PERIODONTAL TREATMENT

- Less favorable response to any kind of periodontal treatment
- Pre-Tx clinical assessment: underestimate PD as gum is less swollen & more fibrosis - more resistant to probing (tight) vs NS
- **Post-Tx SRP/SRD**: less PD reduction & less attachment gain (avg 0.5mm)
- Root surface contaminated by smoking products – may affect attachment of cells
- >10 cigs/day = heavy smoking
- Tooth loss? – Lack long-term studies

TABLE 23.4 Effects of Smoking on the Response to Periodontal Therapy

Therapy	Effects of Smoking
Nonsurgical	↓ Clinical response to root surface debridement ↓ Reduction in probing depth ↓ Gain in clinical attachment levels ↓ Negative impact of smoking with ↑ level of plaque control
Surgery and implants	↓ Probing depth reduction and ↓ gain in clinical attachment levels after access flap surgery ↑ Deterioration of furcations after surgery ↓ Gain in clinical attachment levels, ↓ bone fill, ↑ recession, and ↑ membrane exposure after guided tissue regeneration ↓ Root coverage after grafting procedures for localized gingival recession ↓ Probing depth reduction after bone graft procedures ↑ Risk for implant failure and periimplantitis
Maintenance care	↑ Probing depth and attachment loss during maintenance therapy ↑ Disease recurrence in smokers ↑ Need for retreatment in smokers ↑ Tooth loss in smokers after surgical therapy

↓, Decreased; ↑, increased.

PERIODONTAL TREATMENT ON SMOKERS

- Surgery: smoking decrease tissue oxygenation
- Tissues – prone to infection
- Increase risk of post-surgical wound infection
- Poorer results with all periodontal surgery & dental implants



Smoking. There is strong evidence that smoking is a risk factor for adverse implant outcomes. The evidence shows that smokers have an increased risk of peri-implantitis (reported odds ratios ranged from 3.6 to 4.6) and radiographic marginal bone loss (reported odds ratios ranged from 2.2 to 10) compared to non-smokers. There is some evidence for a dose effect of cigarette smoking.

- **Smoking.** Smoking is not a contraindication for implant placement. However, patients should be informed that the survival and success rates are lower in smokers. Heavy smokers should be informed that they are at greater risk of implant failure and loss of marginal bone. Patients who smoke should be informed that there is an increased risk of implant failure when sinus augmentation procedures are used.

WHY SHOULD YOUR PATIENT QUIT SMOKING?

- Better for gum health & tooth retention
- Increased gingival bleeding – improved vasculature
- Improved healing response: greater PD reductions
- Less risk for moderate or severe periodontitis (OR 3.3 current smokers, 2 for FS vs NS)
- Reduce smoking also reduces risk for developing periodontitis (30cigs/day to 10 cigs/day)
- Passive smoking, foetal health, risk of offsprings smoking, cost
- Time to revert to NS status unknown but may take decades

Table 36.1 Direct benefits of stopping smoking.

Time after cessation	Direct benefits
2 days	Sense of taste and smell improved
1 month	Skin clearer, more hydrated
3 months	Improved breathing, no cough or wheeze Improved lung function (up to 10%) Risk of mouth and throat cancer reduced
6 months	Most smoking-related oral white patches will have disappeared
1 year	Gingival circulation improved
10 years	Risk of heart attack reduced to half that of a smoker
15 years	Risk of lung cancer reduced by half Risk of heart attack same as never smoker

REPRODUCED WITH PERMISSION FROM DROPE J, SCHLUGER NW, EDITORS, THE TOBACCO ATLAS, 6TH EDN, ATLANTA, GA, AMERICAN CANCER SOCIETY AND VITAL STRATEGIES, 2018, P. 37. COPYRIGHT 2018 THE AMERICAN CANCER SOCIETY, INC. REPRINTED WITH PERMISSION FROM WWW.CANCER.ORG¹



QUITTING SMOKING- OUR ROLE

- About 70% of smokers would like to quit
- Most patients see dentists/hygienists more than their GP – opportunity for dentist to help..
- ?? Refer to medical GP



VAPING/E CIGARETTES – DEFINITIONS

- Battery powered devices which heat a liquid containing chemicals and flavouring into an aerosol which is inhaled through a mouthpiece , and then exhaled by the user as a fine particulate smoke- NOT A TOBACCO PRODUCT
- Liquid- **called e-liquid, e-juice ,vape juice**
- Water
- Carrier solution- propylene glycol , glycerine
- Nicotine- but only on prescription in Australia (and present in black market vapes)
- Flavouring – many types

Reusable or disposable

HISTORY OF VAPING

- “Vaping” like device first patented in 1965.
- Vaping word coined in 1979.
- In 2003, a Chinese pharmacist and smoker Hon Lik , in an attempt to give up smoking, is credited with inventing the modern device his company patents were bought by Imperial tobacco in 2013
- Vaping introduced into the EU in 2005/2006.
- Data collection started @ 2011- then 2% of ex and current smokers in England.
- Now 4.2 million (8.3%)users in the UK, 7% are 11-17 year olds
- In Australia in 2019, @ 400, 000 users, dual use is 45% (of vapers who smoke cigs)
- Only 22% of 15-24 year olds have never vaped

MARKETING AND THE USE OF VAPES

- 2015- Juul brand launched in the USA by a silicon valley group. High nicotine .
- HUGE marketing- modern devices, targeted to millennials specifically.
- Adverts in teen magazines , cartoons , school sites- huge increase in sales as not FDA regulated for years

FDA NEWS RELEASE

FDA Denies Authorization to Market JUUL Products

Currently Marketed JUUL Products Must Be Removed from the US Market





Understanding The Different Ty...
jointhevapelife.ie



Vaping – Liberation Programs
liberationprograms.org



The Different Types Of Vape De...
buyv2cigs.co.uk



BIDI Vape – Types of Vaping D...
bidivape.tumblr.com



E-cigarette/Vaping Q&A | Allegr...
allegrodiagnostics.com



What are vaping devices in 202...
mrfog.com



What Are The Different Types o...
ruthlessvapor.com





Figure 1. E-cigarette and heated tobacco devices in a range of designs. From right, two early devices that resemble a tobacco cigarette, so called 'cigalikes'; three 'tank' device which are refillable with e-liquids and rechargeable; a much smaller device that resembles an USB drive and uses nicotine salt technology; finally, a heated tobacco product with the tobacco stick in place.

INGREDIENTS OF VAPES

- Propylene glycol-humectant-used in food, chemical and pharmaceutical industries, generally recognised as safe to consume(toxic in high doses)- *when vapourised- lactic acid, acetic acid, pyruvic acid*. Present in theatrical fog- *National Academy of Science 2018 Toxicity of E- cigarette Constituents*
- Glycerine- also a humectant and preservative - not cariogenic – *but with some fruit flavours may increase microbial adhesion and biofilm formation*.
- Fruit flavours- *some PH below 5.5*
- Diacetyl – butter food flavouring, if inhaled can cause permanent lung damage
- Sweeteners- various
- Other chemicals found in the aerosol vapour not listed in the ingredients –VOC, nanoparticles, heavy metals, formaldehyde...

Table 1 Ingredients listing as it appeared on product packaging/website (including spelling errors)

Country of manufacture	Ingredients as listed
China	• Propylone glycol, vegetable glycerin, natural and artificial flavourings • Propylone glycol, vegetable glycerin, natural and artificial flavourings • Propolyne glycol, glycerol, nicotine, ethyl maltol, phenyl carbinol, flavours
Germany	• Propylene glycol (E1520), glycerin (VG E422), distilled water, natural flavours
UK	• Vegetable glycerin, propylene glycol, Heizenburg flavourings (UK) • Vegetable glycerin, propylene glycol, natural and artificial flavourings • Vegetable glycerin, propylene glycol, flavourings • Propylene glycol, vegetable glycerin, water, berry flavouring, nicotine. Contains linalool may produce an allergic reaction
Netherlands	• Propylene glycol, vegetable glycerin, nicotine, flavourings

RESEARCH FOCUS ON SMOKING VS VAPING

The role of e-cigs in modifying smoking rates

- Divided opinions and data
- Beard et al suggested vaping better than NRT 2020
- Main worry is non-smoking vaping youths x 3 risk of taking up smoking- some evidence that tobacco smoking has increased in the US recently
- Several studies have shown improved periodontal health with smoking cessation and uptake of vaping and increased bleeding

The health risks of e- cigs alone(+/- Nicotine)

- Consumption vs inhalation
- Lung damage associated with Vitamin E acetate/ THC- cannabis derivatives in vaping
- Addiction to Nicotine and youth brain development
- Case reports of oral ulcerations, xerostomia, dry throat, cough
- Longterm data lacking

CURRENT EVIDENCE ON VAPING ALONE AND DENTAL HEALTH

Periodontitis

Microbiological changes

E- cigs influence periodontal microbiome and cytokine profile, 6 month long study, Thomas et al 2022-distinct subgingival microbiome changes in vapers

Clinical changes- In their SR, less BOP noted in several studies (Figueredo et al 2021 The impact of vaping on periodontitis)

Higher than average case and self reported gingival diseases in vapers (US and South Korea)

Xerostomia

Dry mouth and throat reported

Nicotine + humectants

Erosion and caries

Ph of some vaping liquids low

Propylene glycol and glycerine-may have an effect on biofilm (Ganesen et al 2020)

PG-acidic byproducts

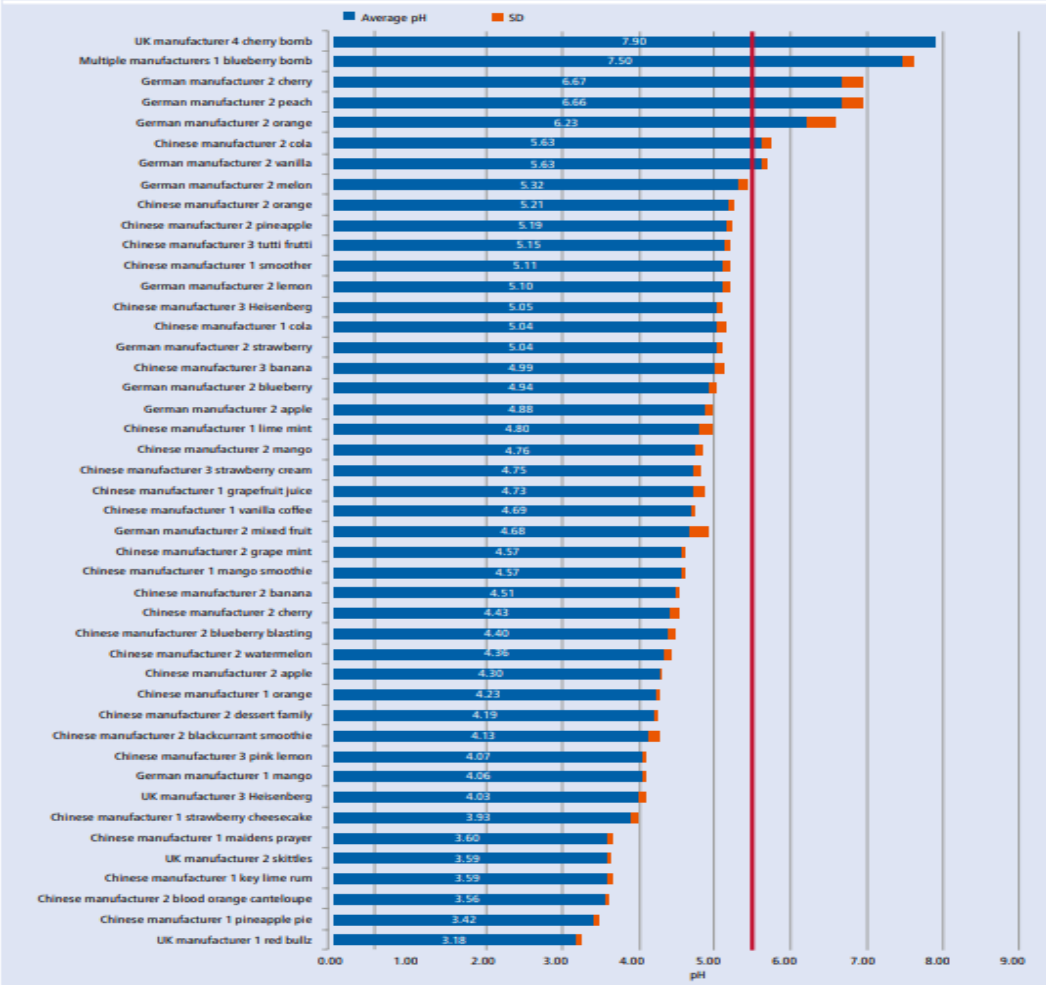
Flavours

Nicotine – increase PH of vapes

No long term data

RESEARCH

Fig. 1 Mean and standard deviation pH of 45 purposefully selected e-cigarette vapes, undiluted and freshly opened. Red line indicates cut off point of erosive potential pH (5.5)



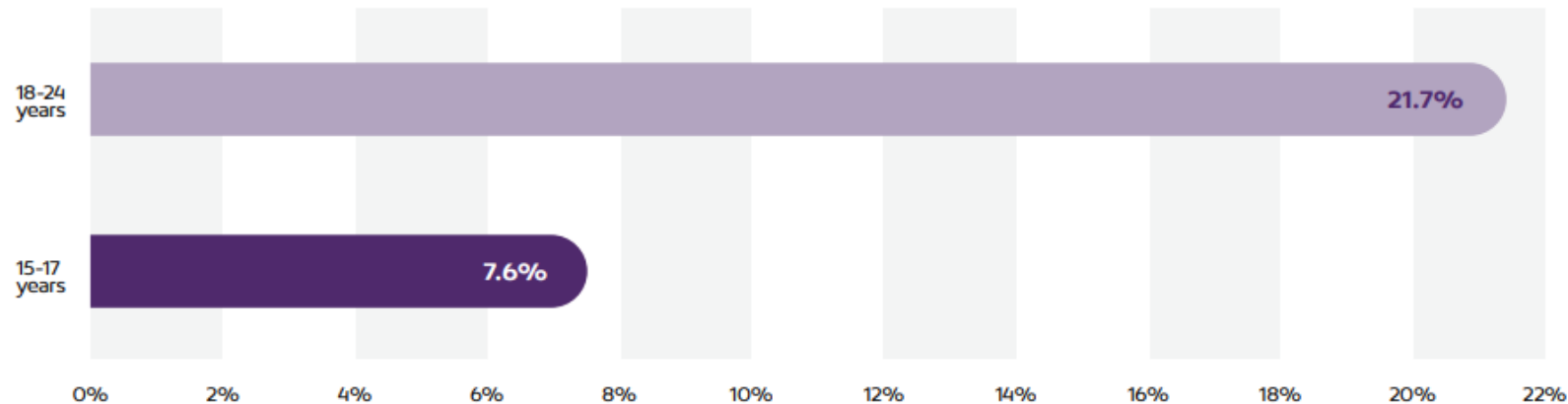
EROSIVE
POTENTIAL OF
VAPES
BDJ 2021 FAIRCHILD
& SETAREHNEJAD

WHY IS THE DATA SO INCONSISTENT?

- Vaping has only begun being studied in the last few years.
- Hundreds of different e-cigarette devices, thousands of e-liquid formulations, nicotine concentrations and flavours, constantly changing market, in many countries unregulated .
- Different users- current smokers with existing disease,
- Healthy non-smokers with no disease,
- Recent ex-smokers +/- disease
- Quitting smokers who smoke and vape +/- nicotine

Vaping in Australia

Australian teens who have used an e-cigarette or vaping device



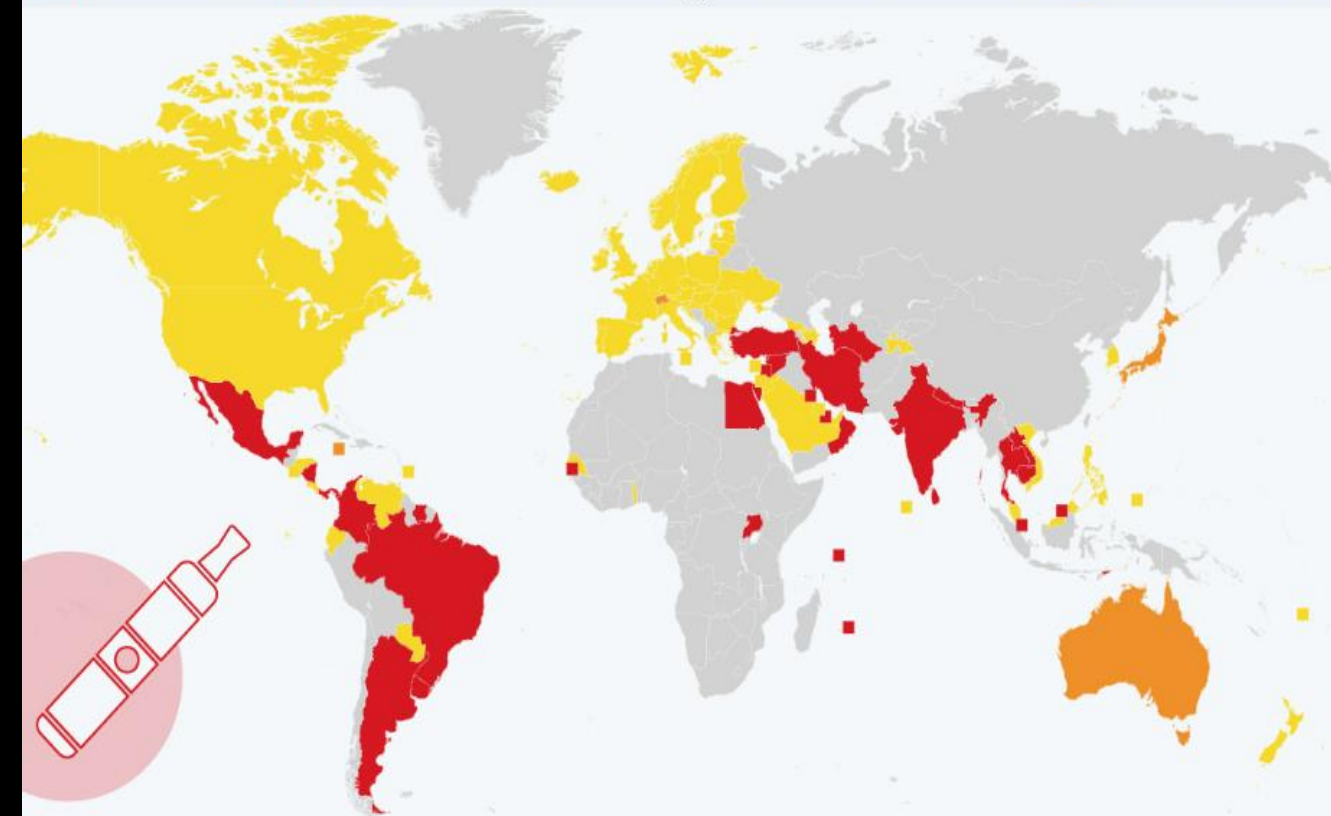
According to the Australian Bureau of Statistics, more than 1 in 5 (21.7%) young Australians aged 18-24 and 7.6% of 15-17 year olds have used an e-cigarette or vaping device at least once. It's likely that these figures are under-reported because responses were provided by an adult living in the same household.

With the exception of Western Australia, each state and territory permits the sale of vapes and e-cigarettes, but not the sale or purchase of liquid flavours that contain nicotine. For this reason, most users purchase their products and liquids online. Doctors in Australia can prescribe nicotine vaping products as a means of weaning off tobacco use, though there is little evidence that vaping is successful in achieving this outcome.

Where E-Cigarettes Are Banned

Laws banning or restricting the sale, use or marketing of e-cigarettes and vapes (2021)

■ Full ban ■ Nicotine-containing varieties banned ■ Restricted



Israel: liquids of >20mg nicotine/mL banned. Indonesia: 57% tax on liquids' retail price

Source: Global Tobacco Control



29 COUNTRIES

6 COUNTRIES –NICOTINE RESTRICTED

45 COUNTRIES- REGULATED

NOW REGULATED AS A TOBACCO
PRODUCT
IN THE UK

FROM 2016, FDA IS REGULATING NC E-CIGS AS A
TOBACCO PRODUCT

IN 2019, THE US CDC CHANGED THE AGE FROM 18 TO 21

IN AUSTRALIA, NICOTINE RESTRICTIONS APPLY.
NON- NICOTINE VAPES CLASSIFIED AS LEGAL CONSUMERS PRODUCTS
NICOTINE CLASSED AS A POISON AND NEEDS A SCRIPT
HENCE E-CIGS IN AUSTRALIA NOT CURRENTLY PROPERLY ASSESSED

Are e-cigarettes dangerous?

Electronic cigarettes (or e-cigarettes) are the most common form of electronic nicotine delivery systems (ENDS) and electronic non-nicotine delivery systems (ENNDS) but there are others, such as e-cigars and e-pipes. ENDS contain varying amounts of nicotine and harmful emissions.

E-cigarette emissions typically contain nicotine and other toxic substances that are harmful to both users, and non-users who are exposed to the aerosols second-hand. Some products claiming to be nicotine-free (ENNDS) have been found to contain nicotine.

The consumption of nicotine in children and adolescents has deleterious impacts on brain development, leading to long-term consequences for brain development and potentially leading to learning and anxiety disorders.

Nicotine is highly addictive and some evidence suggest that never-smoker minors who use ENDS can double their chance of starting to smoke tobacco cigarettes later in life.

Evidence reveals that these products are harmful to health and are not safe. However, it is too early to provide a clear answer on the long-term impact of using them or being exposed to them. Some recent studies suggest that ENDS use can increase the risk of heart disease and lung disorders. Nicotine exposure in pregnant women can have similar consequences for the brain development of the fetus.



Electronic cigarettes (e-cigarettes)

- › **Electronic cigarettes (e-cigarettes) are battery-operated devices that heat a liquid that emits an aerosol which is inhaled through a mouthpiece, and then exhaled by the user as a fine-particulate smoke.**
- › **The liquid is often called ‘e-liquid’, ‘e-juice’, or ‘vape juice’ and is intended to deliver chemicals directly to the lungs.**
- › **Using an e-cigarette is often called ‘vaping’.**
- › **The device often comes in many shapes and sizes and may look like a cigarette. Others may look like everyday items such as pens, highlighters or USB memory sticks.**

E-cigarettes can contain water, flavours, solvents and nicotine. Chemicals found in e-cigarettes, e-liquids, and the aerosol smoke or “vapour” that they generate include: very fine particles; heavy metals such as nickel, tin and lead; volatile organic compounds such as benzene, which is found in car exhaust; and poly-cyclic aromatic hydrocarbons such as naphthalene, found in mothballs. All of these are known to be toxic, including chemicals that can cause cancer.

Many e-cigarettes contain nicotine, which is the highly addictive and poisonous chemical also found in tobacco. Even though an e-cigarette’s packaging might say it is nicotine-free, testing has shown that many e-cigarettes in Australia are labelled incorrectly and in fact do contain nicotine.

E-liquids can come in thousands of different flavours, such as tobacco, confectionery, fruit and other flavours.

The preliminary findings from the review of health outcomes and findings from the review of smoking behaviour in relation to e-cigarettes are that there is:

- Conclusive evidence that intentional or accidental exposure to e-liquids related to e-cigarettes can lead to poisoning, and that poisonings can be severe and can result in death.
- Conclusive evidence that a significant number of poisonings occur in children under the age of six (8,296 between 2012 and 2017 in the United States alone).
- Conclusive evidence that the use of e-cigarettes is related to burns and injuries, and that burns and injuries can be severe and can result in death. There is evidence that the incidence of e-cigarette-associated burns and injuries has increased over time as use has increased (national

TIME MAGAZINE - THE TEENAGER WHO NEEDED A DOUBLE LUNG TRANSPLANT BECAUSE HE VAPED - *MEDIA HYPE OR TIP OF THE ICEBERG?*



Daniel Ament, before and during his illness. Photos courtesy of the Ament family

CASE SCENARIO 23.1

Patient: 62-year-old male

Chief Complaint: “I have tenderness around dental implants that were placed 1 year ago, and I notice bleeding when I’m brushing them.”

Background Information

The patient had a history of hypertension and hypothyroidism. He currently smokes 10–15 hand-rolled cigarettes per day, and he has smoked on and off for over 40 years. He managed to quit for a period around the time of implant placement, but he resumed smoking recently.

The patient sees his dentist regularly, has been edentulous for 10 years and struggled to wear a complete maxillary denture. He uses a powered toothbrush twice per day to brush around the implants.

Current Findings: (1 year after implant placement): Generalized probing depths of 5–6 mm around all the implants. Bleeding on probing score, 80%. Evidence of radiographic bone loss of 2–4 mm from baseline records. Generally poor oral hygiene.



CASE-BASED QUESTIONS	SOLUTION AND EXPLANATION
1. Smokers who receive dental implants are at increased risk for which of the following? A. Failure of osseointegration B. Periimplantitis C. Wound healing complications D. All of the above	Answer: D Explanation: Smoking has myriad effects that will influence the prognosis of a dental implant in both the short and long term. Similar to the effects seen in periodontitis, smokers with implants will have adverse effects on their vasculature, immune and inflammatory responses, and microbiology.
2. If this patient was a current smoker at the time of dental implant placement, would he have been at increased risk of suffering from a dental implant failure? A. No increased risk B. 1.5 times the risk C. 2 times the risk D. 5 times the risk E. None of the above	Answer: C Explanation: There have been numerous systematic reviews on this topic. Overall, they find that smokers are at approximately double the risk of implant failure compared to nonsmokers. Patients should be made aware of this increased risk and every effort made to support them in their efforts to quit smoking.
3. If a patient successfully quits smoking, how long should you wait until placing dental implants? A. 1 week B. 2 months C. 2 years D. Not known	Answer: D Explanation: There is insufficient evidence to say with confidence at what time point a former smoker should receive a dental implant. Some early protocols suggested abstinence for 1 week before, and 8 weeks after dental implant placement, showing significantly improved early outcomes compared to those who continued to smoke.⁷ More contemporary studies have suggested a 2-year cutoff is more useful, with those having dental implant placement earlier than 2 years from the time of cessation having a 2.7 times greater risk of implant failure compared to those who had been abstinent for longer than 2 years.¹⁴⁴ Further research is needed on this topic.
4. What should you advise e-cigarette users (former smokers) who are considering dental implant treatment? A. Stop e-cigarettes immediately. B. Consider cutting down. C. Use nicotine free e-liquids. D. Change the e-liquid flavor. E. Use an individualized approach.	Answer: E Explanation: E-cigarettes are a recent invention (see Box 23.6). Research studies have yet to explore these questions, and no official guidance exists. However, it is likely that e-cigarette aerosol (vapor) is likely to be significantly less harmful than tobacco smoke. Given this situation, it would be most suitable to provide individualized advice to the patient. For example, a patient who has recently given up a habit of smoking 20 cigarettes a day and is using an e-cigarette should not be pressured into immediately abstaining from the e-cigarette, for fear of relapse to cigarette smoking. Indeed, long-term e-cigarette use can be a protective factor against relapse back to smoking (relapse rates of 70% can be expected between 4 and 52 weeks). Because patients highly respect the opinions of health care professionals, it is important that we give the most up-to-date, evidence-based advice.

REFERENCES

Review > [Int J Dent Hyg.](#) 2004 May;2(2):56-63. doi: 10.1111/j.1601-5029.2004.00075.x.

Smoking, periodontal disease and the role of the dental profession

K K Hilgers¹, D F Kinane

Affiliations + expand

PMID: 16451463 DOI: [10.1111/j.1601-5029.2004.00075.x](#)

Australian Dental Journal 2009; 54:(1 Suppl): S44–S50

doi: [10.1111/j.1834-7819.2009.01142.x](#)

Smoking and periodontal disease

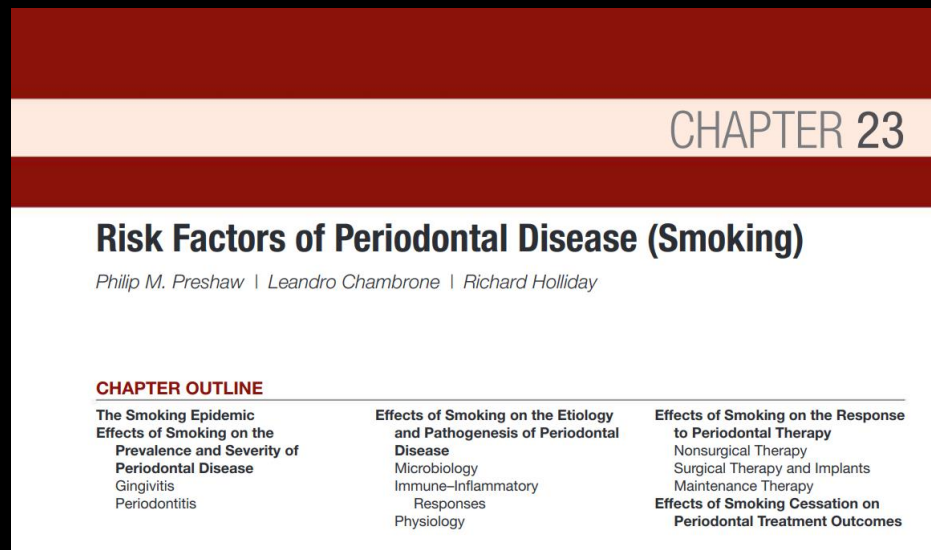
K-Y Zee*

*Westmead Centre for Oral Health and Faculty of Dentistry, The University of Sydney, New South Wales.

- Lindhes Clinical Periodontology and Implant Dentistry Chapter 11,
- 7th Edition 2022

REFERENCES

- Electronic cigarettes :un update on products, regulations public health approaches and oral health
Anthony Weke and Richard Holliday, *Community Dental health* 2022



Electronic cigarettes and Oral Health

JDR, R. Holliday et al 2021