How can the clinical practice and science of periodontology be developed to ensure environmental sustainability?

By Shen Jia Jing

1. Introduction

The raging sun beats down on 15-year-old Muhammad as he sifts through mountains of rubbish for something to sell. The heat sears his worn flip-flops as he trudges through a dump in Nigeria. The surge of waste production in many industries, including the dental industry, has transformed dumpsites into lucrative income opportunities for the less privileged. Such a sight is horrific and unfathomable to us as we lounge in the comforts of our clean homes and cities. We wonder in disbelief, where did this waste originate?

And how is Periodontics related to this?

The sad reality is that Dentistry, a specialisation of Medicine that pledges to "first, do no harm", is heavily involved in Muhammad's dismal situation.

In the UK, plastic waste management in the medical industry amounts to £33 million (Royal College of Nursing, 2018). In the USA, Dentistry contributes 3% to the annual carbon footprint (Duane et al., 2019). Lastly, high volumes of periodontal procedures make Periodontics a significant contributor (Mulligan et al., 2021). It is thus imperative that we take action in our field.

2. Solutions

This section discusses solutions to increase environmental sustainability in Periodontology. These solutions range from personnel within the industry to suppliers and the government.

2.1 Encourage the practice of green dentistry

First, we need to practise green dentistry based on the four R's – Reduce, Reuse, Recycle, and Rethink (Khanna et al., 2018).

2.1.1 Reduce

Though a scale and polish (S&P) procedure may seem harmless, the long list of disposable waste[1] generated speaks otherwise. To reduce, we can replace single-use products like dental explorers with sterilisable ones and single-use cups with biodegradable ones. We can also invest in long-lasting, high-quality equipment (Westman and Tuominen 2000; Garla 2012). Furthermore, clinics should choose suppliers that reduce packaging, and avoid using biomaterials containing microplastic.

2.1.2 Reuse

Disposable items cause the most pollution in Dentistry (Mulligan et al., 2021). Switching to reusable materials alleviates this problem.

[1] 4 x gloves 2 x masks, Rotary brush/cup, Pot for prophylactic paste, Lid prophylactic paste, Dappens dish, Wrapper for disclosing tablet, Oral hygiene aid, Floss

Despite common perceptions that reusable isolation gowns consume more resources due to laundry (Kumar 2021), the truth is that reusable gowns have a two-to-three-fold reduction in water and carbon emissions and a seven-fold reduction in waste (Duane et al., 2019). Thus, it seems that environmental savings from manufacturing fewer gowns offset the additional burden of laundry (Vozzola et al., 2018). Applying this concept to other items like chair drapes will save phenomenal amounts of plastic.

2.1.3 Recycle

Paper tissues are the most disposed waste in dental clinics, followed by nitrile gloves and sterile wrapping (Richardson et al., 2016). Effective separation of recyclables, such as sterile wrapping from non-recyclables, like, nitrile gloves and paper tissues, could reduce waste by 5kg per week at clinics (Richardson et al., 2016). Therefore, recycling will achieve the aims of replenishing resources and reducing wastage simultaneously (Berg and Hager, 2007).

2.1.4 Rethink

Lastly, we need to rethink current practices. For example, clinics can embrace digitalisation by using digital x-rays or electronic data processing systems to reduce paper consumption (Adappa et al., 2015). In addition, steam sterilisation can be used preferentially over chemical sterilisation to save water (Friedericy et al., 2021).

2.2 Implement changes in the workplace

Periodontal maintenance is one of the primary reasons patients head to dental clinics. However, these journeys create the highest carbon emissions (Duane et al., 2019). As such, out of 17 dental procedures, S&P is the second largest carbon footprint (27.1%) (Public Health England, 2018).

Family members should thus schedule their dental appointments together to reduce the environmental damage associated with individual journeys to clinics. Clinics can also provide teledentistry. The government can also enhance public transport and encourage cycling by creating designated cycling tracks and on-to-go bicycle loan services and installing bicycle stands. These measures will enable staff and patients to eschew driving and switch to greener travel methods.

Ultimately, disease prevention remains the gold standard in managing periodontal diseases (Knight et al., 2018). Hence clinicians should equip patients with good oral hygiene instructions to decrease the prevalence of periodontitis and the environmental damage associated with dental procedures.

2.3 Change manufacturing methods

As procurement is the second major contributor to greenhouse gases (Duane et al., 2019), dental suppliers must also change their industrial practices. Manufacturers can reduce waste products from manufacturing processes and incorporate sustainability into designs. Alternatively, manufacturers can emulate companies like Robinson Healthcare Ltd, a single-use instrument (SUI) manufacturer that partners with Healthcare Environmental Group (HEG). HEG recycles SUIs back to products for reuse, increasing environmental sustainability.

2.4 Enforce government guidelines

Despite these measures, we will still be fighting a Sisyphean battle if the government is not involved. Manufacturers will oppose green efforts due to a lack of incentives and awareness of environmental sustainability (Moultrie et al., 2015). Furthermore, stringent guidelines like HTM01-05[2] encourage SUI and discourage reuse. In fact, requirements for sterile wrapping led to a 58% increase in waste management over four years since its introduction (Department of Health, 2013).

Quoting the Swedish environmental activist Greta Thunberg, "We can't save the world by playing by the rules because the rules have to be changed." Governments need to re-evaluate decontamination policies while prioritising environmental sustainability. Governments can also advocate for sustainability by supporting manufacturers and clinics by introducing incentives, guidance, funds and legislation (Duane et al., 2020).

3. Conclusion

When I discarded my PPE and gloves after every clinical session, it never occurred to me where they go beyond the rubbish bin. But for Muhammad and millions of others across the world, the waste mountain outside their window only grows taller, steadily obscuring the sky and sun.

The waste generated by our unsustainable practices today has forced the lives of the less privileged to revolve around it. It will not be long before our actions start to take a toll on us as well. Until then, Periodontics and Dentistry must be the trailblazer in this race for environmental sustainability by constantly keeping the 4Rs in mind and adopting green solutions.

[2] A guideline that is intended to progressively raise the quality of decontamination work in primary care dental services by covering the decontamination of reusable instruments within dental facilities

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