

# Oral health status among Nyaope users at drug rehabilitation clinics in Johannesburg

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## ABSTRACT

Nyaope is an extremely addictive drug mixture having devastating health effects. This comparative cross-sectional analytical study was conducted at two drug rehabilitation clinics in Johannesburg.

### Method

A total of 51 nyaope users and 25 matched non-drug users (NDUs) were recruited. To compare the oral health status between the groups, the DMFT (decayed, filled and missing), PUFA, (pulpal involvement, ulceration caused by dislocated tooth fragments, fistula and abscess), BOP (bleeding on probing) and PPD (periodontal pocket depth) scores were measured. Additionally, a validated questionnaire was administered to assess sociodemographic, diet and dental behaviour among the participants.

### Results

The mean age of nyaope users was 26.4±4.84 years and of NDUs, 26.04±4.09 years. The prevalence and severity (mean DMFT) of dental caries was significantly higher in Nyaope users than NDUs (82.35% vs. 48.0%;  $p=0.03$ ) and [3.97±4.11 vs. 2.04±2.81 ( $p=0.03$ )] respectively. There was no significant difference in the prevalence of BOP ( $p=0.50$ ) and PPD ( $\geq 4\text{mm}$ ) ( $p=0.53$ ) between two groups and the PUFA scores were similar. Only 51% of nyaope users (vs. 100% NDUs) reported daily brushing and 100% (vs. 56% of NDUs) had a highly cariogenic diet.

### Conclusion

Nyaope users had significantly higher cariogenic diets, caries prevalence, and DMFT scores compared with NDUs.

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## ACRONYMS

<b>BOP:</b>	Bleeding On Probing
<b>CPITN:</b>	Community Periodontal Index and Treatment Need
<b>DMFT:</b>	Decayed, Missing, Filled Teeth
<b>IV:</b>	Intravenously
<b>NDUs:</b>	Non-drug users
<b>PPD:</b>	Periodontal Pocket Depth
<b>PUFA:</b>	Pulpal Involvement, Ulceration Caused by Dislocated Tooth Fragments, Fistula and Abscess
<b>SACENDU:</b>	South African Community Epidemiology Network on Drug Use
<b>WHO:</b>	World Health Organisation

## INTRODUCTION

Drug use is an alarmingly common problem in South Africa (SA) and globally and is associated with significant mortality and morbidity.<sup>1-4</sup> Illicit drug users in Africa comprise about 17% to 21% of the total illicit drug users worldwide.<sup>5</sup> In Gauteng, 4026 admissions to 18 treatment centres were recorded from January to June 2013.

The most commonly used substance was cannabis (40%), followed by alcohol (27%), heroin (12%), methcathinone (8%), 'nyaope' (4%), methamphetamine (3%) and cocaine (3%).<sup>6</sup> 'Nyaope' is a drug cocktail consisting of varying mixtures of heroin, marijuana, anti-retroviral drugs, rat poison etc., which has become a popular trend among South African youths.<sup>7</sup>

Nyaope, also known as 'whoonga' and 'sugars', is a lethal and extremely addictive South African street drug which continues to ravage the lives of youth and shatter communities.<sup>8,9</sup>

Nyaope is reported to have originated in the townships of Soshanguve and Mamelodi in Pretoria in 2000. Since then many people, almost all of whom are poor and black have become addicted to the drug which is very accessible due to its low cost (approx. R30 a joint).<sup>10,11</sup> In 2013, the average age of nyaope users was 24 and even primary school children reportedly used the drug.<sup>6,11</sup>

Nyaope use has a significant impact on health, society and the economy.<sup>11,12</sup> Nyaope use has adverse effects on multiple systems of the body including the oral cavity. Nyaope users experience great psychological and physical turmoil when trying to stop using the drug. There is inadequate infrastructure for the rehabilitation of nyaope

users in the public sector and they are too poor to afford private rehabilitation centres. Additionally, nyaope users require a minimum of one year of comprehensive care for successful rehabilitation.<sup>11</sup>

Although the destructive effects of nyaope have been widely publicized in the media, very few South African studies have objectively examined the systemic effects of nyaope. There are no studies which have examined the oral health of nyaope users. It is important to examine the oral effects of each of the potential constituents of nyaope, as well as the oral effects of other commonly used drugs because it contains a variety of drugs (ranging from cannabis, heroin and methamphetamine) and users commonly practice poly-drug abuse.<sup>12</sup>

Heroin use is associated with increased incidence of dental caries, xerostomia, periodontal disease, oral fungal and viral infections and hyperpigmentation of the tongue.<sup>13,14</sup> Dental caries in heroin users are darker and are typically located on the buccal and labial surfaces, features that may be pathognomonic for heroin use.<sup>2</sup>

Cannabis use causes xerostomia and, therefore, chronic use is associated with a higher risk of caries. Cannabis, when smoked or chewed, also may cause 'cannabis stomatitis.' This is a condition characterized by hyperkeratosis and leukoedema of the buccal mucosa which, with chronic use, may progress to leukoplakia and neoplasia of the oral epithelium.<sup>15</sup> Additional effects of cannabis use include gingivitis, alveolar bone loss, gingival hyperplasia, oral papillomas, uvulitis and tongue carcinoma.<sup>13</sup>

The chronic use of methamphetamine results in a condition called 'meth mouth' which is characterized by severe dental caries located specifically on buccal and lingual surfaces together with extensive destruction of coronal tooth structure.<sup>16</sup> Methamphetamine is a sympathomimetic amine that causes vasoconstriction of the vasculature of salivary glands leading to reduced salivary flow.<sup>17</sup> Methamphetamine is more likely to result in the loss of teeth when used intravenously as opposed to smoking the drug.<sup>18</sup>

The present study was conducted at two drug rehabilitation centres in Johannesburg in order to characterise the effects of nyaope on oral health and to investigate the oral health behaviours of nyaope users.

The aim of the study was to determine the oral health status (i.e. periodontal status, soft and hard tissue status) of nyaope users and to examine risk factors associated with oral diseases at two drug rehabilitation clinics in Johannesburg. The objectives of the study were to determine the demographic characteristics of nyaope users and to compare the oral health status scores of nyaope users at two drug rehabilitation clinics in Johannesburg against those of a matched group of non-drug users, using epidemiological tools such as the decayed missing filled teeth (DMFT) and pulpal involvement, ulceration caused by dislocated tooth fragments, fistula and abscess (PUFA). Additionally, this study sought to compare oral health behaviours and oral hygiene practices among nyaope users and non-drug users in this cohort of patients.

## METHODS

### Study design

This was a comparative cross-sectional analytical study which included patients (i.e. nyaope users) from Empilweni drug rehabilitation centre (Soweto) and Nishtara Alcohol and Drug Centre (Lenasia) in Johannesburg. Matched patients were non-drug users (NDUs) recruited from a community dentistry outreach site in Johannesburg, the OR Tambo clinic. This primary care clinic serves the community of Diepsloot, Johannesburg, and provides basic medical and dental services. Patients who attended for routine medical check-ups were recruited as matched NDUs. Patients attending the dental services section of the clinic were excluded.

### Patient selection

Patients who were admitted to these two-drug rehabilitation centres from 1 September 2016 to 29 December 2016, were invited to participate in this survey. Nyaope users were identified with the aid of in-patient records. The control group of NDUs were patients with social demographics (i.e. age, gender and race) matching those of patients in the nyaope group. All nyaope users and NDUs provided written informed consent. Nyaope users were alert and not intoxicated when informed consent was obtained. All the participants were 18 years old or above.

### Sample size

Sixty-one patients were admitted to the Empilweni Drug Rehabilitation Centre and Nishtara Drug Centres from 1/09/16 to 29/12/16. Ten nyaope users refused hospital admission (i.e. signed refusal of hospital treatment form), and were not included in the study. Fifty-one nyaope users were interviewed and examined from 1/09/16 to 29/12/16. For maximum conformity of data and verification of this study method, 25 matched NDUs were recruited. There was one NDU for every two nyaope users (1:2 ratio). This recruitment was similar to a study by Mateos-Moreno et al which compared the oral health of 70 drug addicts with that of a control group comprising 34 patients.<sup>19</sup> All 25 NDUs who were examined were male as virtually all nyaope users were male (i.e. 50 out of 51).

### Data collection

Data collection for the study involved the completion of a questionnaire by participants. The questionnaire was derived from the World Health Organization Alcohol, Smoking and Substance Involvement Screening Test version 3.0 (WHO ASSIST V3.0) questionnaire and the American Dental Association proposed health questionnaire.<sup>20,21</sup> It was modified to meet the aims and objectives of the study. As nyaope was not listed in the WHO ASSIST V3.0 questionnaire, it was added under the drug history section of the questionnaire in this study.

The World Health Organization (2013) oral health assessment form was utilized in the determination of the oral health of all the study participants.<sup>22</sup> The form provided for the recording of the clinical findings which included periodontal status and decayed, missing, filled teeth (DMFT) score, and, additionally, the recording of

the pulpal involvement, ulceration caused by dislocated tooth fragments, fistula and abscess (PUFA) scores for the clinical consequences of untreated caries in both groups. The bleeding on probing (BOP) and periodontal pockets depth (PPD) were graded with the use of the modified community periodontal index (CPI) which entailed examination of pocket depths and gingiva for bleeding.

The PUFA score was calculated as the sum of each component score. Untreated caries PUFA ratio was calculated by following method:<sup>23</sup>

$PUFA \times 100/D$  (D= Decayed component of DMFT score)

A score for gingival BOP and PPD was given based on the presence or absence of condition.<sup>22</sup>

Gingival bleeding on probing score (BOP)	Periodontal pocket depth score (PPD)
0 = Absence of BOP	0 = Absence of PPD
1 = Presence of condition	1 = Pocket 4-5 millimeter (mm) 2 = Pocket 6 mm or more
9 = Tooth excluded	9 = tooth excluded
X = Tooth not present	X = Tooth not present

### Data analysis

The collected data was analysed using Statistica version 13.2. Descriptive and inferential statistical analysis were performed at  $p < 0.05$ . For comparisons involving contingency cells with very small numbers ( $<5$ ), the Fisher Exact Test was used.

### Ethics

This research received ethics approval from the Human Research Ethics Committee of the University of the Witwatersrand (Ethics Clearance no : M160610). Further permission and consent were sought from the Empilweni Drug Rehabilitation Centre and Nishtara Alcohol and Drug Centre, as well as from each of the participants.

## RESULTS

### Demographics of nyaope users and NDUs:

Baseline characteristics of nyaope users and NDUs are shown in Table 1.

Demographics	Nyaope users (n = 51)	Matched NDUs (n = 25)	p-value
Age (mean±SD)	26.40 ± 4.84	26.04 ± 4.09	0.75
Gender (%)			
Male	50 (98.04)	25(100)	0.95
Female	1 (1.96)	0	0.67
Race (%)			
Black	48 (94.12)	25 (100)	0.86
Coloured	3 (5.88)	0	0.31
Education (%)			
Primary school	34 (66.67)	3 (12.00)	0.004
High school	15 (29.41)	14 (56.00)	0.144
College	2 (3.92)	8 (32.00)	0.004

### Diet and brushing habits of nyaope users and NDUs:

Persons who consumed junk food (i.e. soft drinks and sugary foods) on a daily basis were categorized as having an unhealthy diet. The number of nyaope users brushing their teeth twice daily was also significantly lower than the non-drug users ( $p$ -value 0.0003). Twenty-five nyaope users reported that they never brushed their teeth or did so only occasionally. Table 2 illustrates the diet and brushing habits of nyaope users and NDUs.

	Nyaope users (n = 51)	Matched NDUs (n = 25)	p-value
Diet (%)			
Healthy diet	0	11 (44)	<0.001
Unhealthy diet	51 (100)	14 (56)	0.004
Brushing habits (%)			
Never	4 (7.84)	0	0.0002
Occasionally	21 (41.18)	0	0.002
Once daily	22 (43.14)	10 (40)	0.86
Twice daily	4 (7.84)	15 (60)	0.0003

### Comparison of oral health of nyaope users and NDUs:

There was a significantly higher mean DMFT score amongst the nyaope users when compared with the NDUs ( $p = 0.03$ ). Tables 3 and 4 illustrate mean DMFT and PUFA scores and the prevalence of each component of the DMFT index, the BOP and PPD scores among nyaope users and NDUs, respectively.

Indices	Nyaope users (Mean±SD)	Matched NDUs (Mean±SD)	p-value
DMFT score	3.97 ± 4.11	2.04 ± 2.81	0.03
Decayed	2.92 ± 3.23	1.56 ± 2.16	0.03
Missing	0.86 ± 1.50	0.36 ± 0.86	0.12
Filled	0.19 ± 0.80	0.12 ± 0.43	0.65
PUFA index	1.19 ± 3.05	0.68 ± 1.28	0.42
Pulpal	1.15 ± 3.06	0.68 ± 1.28	0.45
Ulceration	0.04 ± 0.28	0	0.48

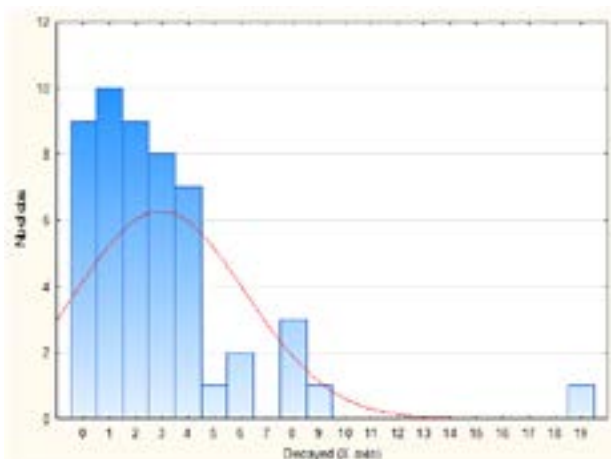
Please note there were no fistula and abscess formation in both groups.

Variables	Nyaope users %	Non-drug users %	p value
Decayed	82.35	48	0.03
Missing	39.22	24	0.34
Filled	7.84	8	0.98
BOP	19.61	16	0.50
PPD (≥4mm)	13.73	16	0.53

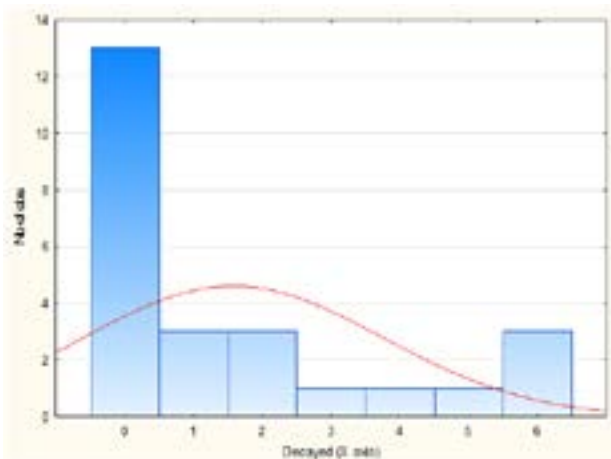
The untreated caries PUFA ratios among nyaope users and NDUs were similar (40.94% and 43.59%), indicating that these proportions of the decayed component had progressed to pulpal involvement.

Figure 1 shows the frequency histogram depicting non-normal distribution of decayed teeth among nyaope

addicts with a median of 2.0 (interquartile range 1.0-4.0). This histogram shows that nine nyaope addicts had a decayed score of 0. The highest number of nyaope addicts ( $n=10$ ) had decayed scores of 1. Only four nyaope addicts had a decayed score of 8 and 9. One nyaope addict had the highest decayed score of 19.



**Figure 1.** Frequency histogram depicting non-normal distribution of decayed teeth among nyaope users (X axis: number of decayed teeth. Y axis: number of cases with decayed teeth).



**Figure 2.** Frequency histogram depicting non-normal distribution of decayed teeth among non-drug users (X axis: number of decayed teeth. Y axis: number of cases with decayed teeth).

## DISCUSSION

This research aimed to characterize the oral health status and behaviour of nyaope users. All those in the current study were male except for one female, a finding which is similar to that described by other studies.<sup>6,11</sup>

Blacks (94.12%) were the predominant users of nyaope in this study followed by Coloureds (5.88%). The socio-economic characteristics (age, race and gender) of the nyaope users in our study are similar to those featured in a report on the characteristics of drug-related admissions in all South African provinces from January to June 2013 by South African Community Epidemiology Network on Drug Use (SACENDU).<sup>6</sup> The mean age of nyaope users in this study was 26.4 years, whilst SACENDU reported a mean age amongst Gauteng users of 24 years.<sup>6</sup>

The predominant method of using nyaope in this study was through smoking (84.31%). However, a small number used the drug through the IV route (5.89%) or

through a combination of smoking and IV route (9.80%). These findings were also consistent with the SACENDU survey.<sup>6</sup>

The study showed nyaope users to have a diet consisting mostly of processed foods (e.g. biscuits, chips) and sugary drinks, significantly more unhealthy than that of NDUs (100% vs 56%;  $p=0.004$ ). Whilst the literature on the dietary habits of nyaope users is scarce, there is evidence indicating that drug addicts have a poor diet which is often rich in sugar.<sup>2</sup> The findings of the current study were similar to those of Schulz-Katterbach et al. and Robinson et al.<sup>14,24</sup>

Schulz-Katterbach et al. examined the risk of caries among 43 marijuana users (cases) and 42 cigarette smokers (controls).<sup>24</sup> The study found that marijuana users had a considerably higher consumption of sugary drinks than did cigarette smokers ( $p=0.0078$ ).<sup>24</sup> In another study, Robinson et al. examined the oral health behaviour of British drug abusers, most of whom used heroin.

Their report highlighted the conclusion that although drug use was associated with appetite suppression among drug users, it also caused them to crave sugar-rich foods (e.g. doughnuts, sugary drinks).<sup>14</sup> Thus, it appears that abusers of marijuana and heroin, which are the main constituents of nyaope, have a propensity to consume sugary foods and drinks.<sup>14,24</sup>

There are no studies regarding the brushing habits and oral health of nyaope users. In this investigation, nyaope users were less likely to brush their teeth when compared with NDUs ( $p=0.002$ ). A matched case-control study examined the oral diet, oral health behaviour and caries status among cases (methamphetamine abusers,  $n=18$ ) and controls (non-methamphetamine users,  $n=18$ ).<sup>25</sup> The likelihood of methamphetamine users never brushing their teeth was significantly higher in comparison with that of controls ( $p<0.001$ ),<sup>25</sup> a finding similar to that of the current study.

The mean DMFT score was significantly higher ( $p=0.03$ ) among nyaope users in comparison with NDUs. Nyaope users also had significantly higher prevalences of dental caries compared with NDUs ( $p=0.03$ ). These observations were similar to those of a study which was conducted by Smit on 308 methamphetamine users.<sup>26</sup> Possible reasons for the higher DMFT score among nyaope users were the poor diet and poor oral hygiene, chronic use of nyaope and poly-drug use and unfavourable socioeconomic circumstances (poor education and unemployment). All of the NDUs brushed their teeth at least once daily whereas only 51% of the nyaope users did so. Also, Mateos-Moreno found that the mean DMFT score was significantly higher among poly-drug users than control subjects ( $p<0.001$ ).<sup>19</sup>

Although the mean DMFT score of nyaope users in the present study was higher than amongst the matched NDUs, it was significantly lower than the DMFT scores of drug users reported by multiple previous studies.<sup>19,27</sup> Possible reasons for this finding in this investigation were comparatively better oral hygiene among nyaope users (51% brushed teeth daily), shorter duration of nyaope use ( $6.8\pm 3.42$  years) and younger age ( $26.4\pm 4.84$ ). A Chinese study which studied the oral health of ex-heroin users

(n=445) also demonstrated mean decayed, filled and missing teeth indices similar to those of the present study. Seventy five percent of the Chinese subjects brushed their teeth daily.<sup>28</sup> Notably, drug users in this present study and the Chinese study had better oral hygiene practices than did those of the 64 drug users reported by Mateos-Moreno et al. (only 36% brushed teeth daily).<sup>19,28</sup> That comprehensive survey examined the oral health of poly-drug users who had been using drugs for a period of up to 30 years, substantially more than the nyaope users in the present study (maximum of 15 years). It is possible that the longer duration of drug use amongst the subjects in the study by Mateos-Moreno contributed to their higher DMFT score.<sup>19</sup>

The mean PUFA score among nyaope users and NDUs was 1.19 and 0.68 respectively. As there is a paucity of literature on the PUFA indices of poly-drug users, these findings could not be compared. The clinical consequences of untreated caries may be objectively measured by the 'Untreated Caries, PUFA Ratio',<sup>23</sup> which in this study among nyaope users and NDUs was 40.9% and 43.6%, respectively. This indicated that 40.9% of nyaope users and 43.6% of NDUs had progression from dental caries to pulpal involvement. These findings indicate that a significant proportion of these individuals do not seek care in the early stages of the diseases and possible wait for the appearances of clinical signs and symptoms of tooth decay before seeking help. These factors highlight the need for prompt treatment of dental caries (i.e. endodontic treatment and extraction).

Bleeding on probing was higher among nyaope users (19.61%) than NDUs (16%), although the difference was not significant ( $p=0.50$ ). Reddy et al. conducted a comparative study which examined the periodontal status of drug users (n=250) and age- and sex- matched non-drug users (n=250). Drug users were found to have a lower BOP than the control group ( $p<0.001$ ), a lower prevalence which may be explained by the high rate of smoking (67.6%) among the drug users.<sup>29</sup> Equally, the low prevalence of BOP in the present study may also be associated with the high prevalence of smoking among both groups (i.e. all nyaope users and about half of non-drug users).

Smoking reduces BOP through vasoconstriction of the gingival blood vessels and limiting blood flow to the gingivae. Smoking results in blunting of the normal inflammatory cascade that is activated when gingivae are exposed to bacterial plaque. Therefore, the actual extent of gingival inflammation may not be clinically visible.<sup>29</sup>

The current study found periodontal pocket depth scores (i.e. pockets  $\geq 4$ mm) present among 13.73% of nyaope users. Ma et al. reported on a sample of 445 ex-heroin abusers, 197 of whom were younger than 35 years. Among the younger users, 17.3% had periodontal pockets. All the nyaope users in the present study except for one were of ages  $\leq 35$  years. Therefore, the prevalence of periodontal pockets among nyaope users in this study was similar to that of ex-heroin users in the study by Ma et al.<sup>28</sup> Possible reasons for the lower prevalence in periodontal diseases (i.e. BOP and PPD scores) in the present study were a reduced number of study participants (n=76), younger study participants (mean age 26 years) and shorter duration of nyaope use (1-15 years).

The sample size of this study was comparatively smaller than those of the studies described previously.<sup>28,29</sup> Study of the literature has indicated that periodontal diseases have a strong association with increasing age and duration of drug use.<sup>28</sup>

### Limitations of study

This study has a number of limitations. Importantly, there has been no previous research on the oral health behaviour of nyaope users and the effects on oral health of nyaope use. Therefore, the results of this study could not be compared with previous studies. The sample size of the study was relatively small due to resource constraints. These included limited availability of assistants for data collection and a low admission rate of nyaope users at the rehabilitation centres. Education was a significant confounding factor in this study as it may have resulted in a lower mean DMFT score among control groups. It is likely that a large number of nyaope users do not seek help and do not admit themselves to rehabilitation facilities. Therefore, a significant number of nyaope users with poor oral health are missed.

### CONCLUSION

Nyaope users had significantly higher cariogenic diets, caries prevalence, and DMFT scores compared with non-drug users. Additionally, Nyaope users were also significantly less likely to practice daily brushing than non-drug users. Risk factors associated with sub-optimal oral health were inadequate education, poor diet and oral hygiene practices, unemployment and prolonged nyaope use.

### Recommendations

A number of steps can be taken to improve the oral and general health of nyaope users in the community. Large scale studies are required to confirm the findings of this study and also to provide further knowledge in the behaviour (including oral health behaviour) and the oral health of nyaope users. Adequate oral health among nyaope users can only be achieved through a holistic approach. The management of nyaope addiction should address the physical (including oral health), psychological, socio-environmental and political aspects of the disease. Every nyaope addict admitted to a rehabilitation centre must have a complete and thorough initial physical examination and must be referred to a physician, a psychologist and a dentist. They must be counselled at each opportunity and by each health professional about the harmful effects of nyaope.

However, these measures may not suffice. The reality is that successful rehabilitation of hard-drug addicts is a very complex problem and requires the participation of families, communities and politicians. Family members have an important role in the rehabilitation of nyaope users.

It is important to note that a number of recommendations applicable to poly-drug users appear to also apply to nyaope users. Drug use in general appears to have serious adverse oral health effects which warrants that this group be regarded as high risk for oral diseases.

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## Do the CPD questionnaire on page 44



### Online CPD in 6 Easy Steps

- Go to the SADA website [www.sada.co.za](http://www.sada.co.za).
- Log into the 'member only' section with your unique SADA username and password.
- Select the CPD navigation tab.
- Select the questionnaire that you wish to complete.
- Enter your multiple choice answers. Please note that you have two attempts to obtain at least 70%.
- View and print your CPD certificate.