

Oral-health related quality and substance use disorder

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ABSTRACT

Why the work was done: The oral health impact of substance use disorder (SUD) has been comprehensively described, but not as yet been investigated for its effect on oral health-related quality of life (OHRQoL) especially within the South African context. **How the work was done:** A cross-sectional study with a mixed methods approach was applied to investigate the oral health impact of SUD and the objective was to assess OHRQoL of drug users admitted to a treatment centre. A validated questionnaire (OHIP-14) supported by clinical oral examinations was applied to achieve the aim of the research project. A sample of 504 patients enrolled in a treatment programme for SUD within the Western Cape was included in the study. All ethical considerations were adhered to. **What are the main findings:** The physical pain and psychological discomfort dimensions of the instrument showed the highest negative impact on OHRQoL with a mean of 3.51 and 3.4 respectively. A significant difference in OHIP-14 score was detected for those who used alcohol as well as for those who used methamphetamine as a primary drug. Those who used heroin/opiates and methamphetamine had the highest OHIP-14 score. A multivariate regression analysis found that 19% of the variability in the OHIP score could be explained by the combined effect of the risk predictors cigarette smoking, DMFT-score, poly-drug use, level of education, number of extractions needed, active caries and having a medical condition or not. **Why the work is important:** The present study highlighted the drug-specific oral health impact of SUD and reaffirmed dental status and oral health behaviours are poor among these patients. Therefore, oral health professionals as well as staff at treatment centres can play a significant part in placing more emphasis on oral health during treatment for SUD.

BACKGROUND

Substance use disorder (SUD) is the problematic use of alcohol, hallucinogens, opioids, cocaine, cannabinoids, sedative hypnotics, tobacco and other illicit stimulants (Cuberos *et al.*, 2020). Oral health burden of disease and SUD are intertwined with South Africa's socio-economic disparities such as the lack of access to basic oral health care (Smit *et al.*, 2017). Aspects such as oral health status and history of substance use have been investigated in previous studies, but there is a paucity of information on the oral health effects of different drug types. The oral health impact of SUD has been comprehensively described outside South Africa (Murphy *et al.*, 2016; Mukerjee *et al.*, 2018; Abdelsalam, 2023), but not as yet been investigated for its effect on Oral Health Related Quality of Life (OHRQoL) especially within the South African

context. Oral health status of substance users does have a substantial effect on their quality of life, which can be greatly improved by dental treatment (Van Wijk *et al.*, 2016). In 2017, Antoniazzi *et al.* (2017) found that crack users and other drug users exerted a negative impact on OHRQoL compared to controls independently of socio-demographic characteristics and tobacco use (Antoniazzi *et al.*, 2017). The association between SUD and OHRQoL in poly-drug users also remains unclear. The present study investigated the oral health status, dental treatment needs, oral health behaviour (OHB) and OHRQoL of patients who were enrolled in a treatment programme for SUD in the Western Cape, South Africa.

MATERIAL AND METHODS

The aim of the study was to investigate the oral health impact of SUD. A cross-sectional study design with a mixed methods approach was applied. A major focus of the study involved a descriptive quantitative component to investigate oral health status, oral health behaviour, dental treatment needs and OHRQoL of participants. This was achieved by using a structured researcher-administered questionnaire and performing oral examinations to measure decayed, missing and filled teeth (DMFT) as well the presence of periodontal disease via the basic periodontal examination (BPE). The OHIP-14, developed by Slade (1997) known for its good reliability, validity and precision was used to investigate OHRQoL. The study population were enrolled adult patients at registered SUD treatment centres in the Western Cape. Sample selection took into consideration the prevalence of SUD as well as the on-point population enrolled for SUD treatment. The sample size was estimated with an 80% power and 5% level of significance and a delta of -0.129. $n = 2 \{Z\alpha/ES\}^2 = 2 \{1.96/(-0.129)\}^2 = 457.00$. Finally, 504 patients were included to ensure a robust sample size and to safeguard a decent buffer for data analysis. The exclusion criteria were individuals who were re-entering a treatment programme and who had participated in the study previously. Captured data was exported to Microsoft Excel, Epi Info version 7 (CDC) and STATA (Stata Corp., College Station, TX). Student's t-test was used to investigate differences between group means and proportions respectively and Spearman's rank correlation for associations. Chi Square (χ^2) tests were used to test for association and when assumptions were not met, the Fisher's exact test (FET) was applied. P-value for statistical significance was set at 5%. Post-hoc analyses, including Bonferroni, Sidak, and Scheffé tests, were performed. Both univariate and multivariate Poisson regression analyses were done to examine the relationship between various variables and the OHIP-14 overall score. Potential confounding variables such as age, gender and cigarette smoking were controlled in the multivariate regression analysis models. Ethical approval to conduct the study was obtained from the University of the Western Cape (UWC) Bio-Medical Research Ethics Committee (BMREC), City of Cape Town as well as from the Provincial Government of the Western Cape. Participation was anonymous, voluntary, and confidential. The purpose of the study was explained through the study information sheet

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and informed consent was obtained before data collection. All collected data was secured in a locked office and on a password protected computer.

RESULTS

Each of the 14 questions on the OHIP-14 questionnaire, a 5-point Likert scale response format (0 = never, 1 = hardly ever, 2 = occasionally, 3 = fairly often, 4 = very often) was given. The sum of the scores was used to calculate a total score as well as the sum for each of the 7 dimensions. Higher scores indicated a poorer OHRQoL and thus a

greater negative impact on OHRQoL. The mean OHIP-14 score for the sample was 18.93. The physical pain and psychological discomfort, over the preceding 12 months, showed the highest mean scores, while the functional limitation- and handicap dimensions showed the lowest scores (Table 1).

Those who used heroin/opiates and methamphetamine had the highest OHIP-14 score among all the drug groups. However only methamphetamine users had a significant difference in OHIP-14 compared to the rest of the sample

Table 1: Severity of OHIP-14 for the sample

Question: In the last 12 months,	OHIP specific dimension score				
	mean	median	range	SD	IQR
FUNCTIONAL LIMITATION	1.94				
1. Trouble pronouncing words	0.81	0	0 – 4	1.22	0 – 2
2. Worsened taste	1.13	1	0 – 4	1.37	0 – 2
PHYSICAL PAIN	3.51				
3. Painful aching in mouth	1.75	2	0 – 4	1.44	0 – 3
4. Discomfort eating food	1.76	2	0 – 4	1.53	0 – 3
PSYCHOLOGICAL DISCOMFORT	3.40				
5. Feeling self-conscious	1.78	2	0 – 4	1.65	0 – 4
6. Feeling tense	1.62	2	0 – 4	1.54	0 – 4
PHYSICAL DISABILITY	2.50				
7. Poor diet	1.17	0	0 – 4	1.44	0 – 2
8. Interrupted meals	1.33	1	0 – 4	1.45	0 – 4
PSYCHOLOGICAL DISABILITY	3.09				
9. Difficult to relaxing	1.36	1	0 – 4	1.46	0 – 2.5
10. Embarrassed	1.73	2	0 – 4	1.65	0 – 3.5
SOCIAL DISABILITY	2.50				
11. Irritable with other people	1.46	1	0 – 4	1.53	0 – 4
12. Difficulty doing your usual jobs	1.04	0	0 – 4	1.37	0 – 2
HANDICAP	2.02				
13. Life less satisfying	1.19	0	0 – 4	1.47	0 – 4
14. Totally unable to function	0.83	0	0 – 4	1.23	0 – 2
Total	18.93	17	0 - 56	1.23	0 – 2

Table 2: History of primary drug use & cigarette smoking according to OHIP-14 score

		OHIP-14 total score						p-value
		n	%	mean	median	SD	IQR	
Poly-drug use	Yes	323	64	21.36	19	15.7	8 – 34	< 0.0005
	No	181	36	14.61	11	14.0	2 – 23	
Most preferred method of use	Injecting	15	3	22.93	24	10.9	14 – 29	< 0.0005
	Snorting	12	2	16.92	17.5	13.8	3.6 – 22	
	Swallow	113	22	13.05	10	12.6	2 – 21	
	Smoke	364	72	20.67	18	16.0	6 – 33.5	
Duration of addiction	1 – 10 years	204	40	18.81	17	15.5	5 – 29	> 0.05
	11 – 20 years	206	41	19.60	18	15.4	6 – 30	
	21 years and more	94	19	17.75	14	15.5	4 – 29	
	No	316	63	17.97	16	15.0	4 – 28	
Frequency of primary drug use	Daily	317	63	20.35	18	15.1	8 – 30	< 0.005
	Weekly and less	187	37	16.53	12	15.7	2 – 28	

Table 3 OHIP-14 score for each dimension according to main primary drug use

Main primary drug groups	Alcohol	Cannabis	Mandrax	Opiates	Meth	p-value
FUNCTIONAL LIMITATION						
	mean OHIP-14 score					
1. Trouble pronouncing words	0.53	0.91	1.02	0.64	0.87	> 0.05
2. Worsened taste	0.66	1.04	1.08	1.60	1.30	< 0.005
PHYSICAL PAIN						
3. Painful aching in mouth	1.37	1.51	1.60	2.48	1.92	< 0.005
4. Discomfort eating food	1.36	1.82	1.73	2.16	1.89	< 0.05
PSYCHOLOGICAL DISCOMFORT						
5. Feeling self-conscious	1.20	2.12	1.52	2.48	1.90	< 0.0005
6. Feeling tense	1.16	1.67	1.52	2.32	1.74	< 0.005
PHYSICAL DISABILITY						
7. Poor diet	0.72	1.16	1.19	1.40	1.33	< 0.05
8. Interrupted meals	0.86	1.22	1.60	1.52	1.49	< 0.005
PSYCHOLOGICAL DISABILITY						
9. Difficult to relaxing	0.92	1.44	1.44	1.20	1.55	< 0.05
10. Embarrassed	1.19	1.84	1.65	2.04	1.90	< 0.005
SOCIAL DISABILITY						
11. Irritable with other people	0.87	1.38	1.71	1.72	1.65	< 0.0005
12. Difficulty doing your usual jobs	0.63	0.98	1.33	1.24	1.14	> 0.05
HANDICAP						
13. Life less satisfying	0.71	1.44	1.19	1.28	1.34	< 0.005
14. Totally unable to function	0.48	0.80	0.96	0.68	0.98	< 0.05
Total OHIP-14 score	12.65	19.40	19.54	22.76	20.98	< 0.0005

OHIP prevalence (prevalence of a negative impact on OHRQoL)

($p < 0.005$). Those who used alcohol as a primary drug had the lowest OHIP-14 score. Methamphetamine users were the most negatively impacted by finding it difficult to relax and feeling totally unable to function (Table 3).

OHIP-14 responses were categorized and classified to signify the presence of a negative impact on OHRQoL if there was at least one response of "fairly often" or "very often". The added percentage of "fairly often" and "very often" responses were used to determine prevalence. Those who were using heroin/opiates showed the highest OHIP prevalence at 80% followed by methamphetamine (68%)

while those who used alcohol (46%) and mandrax (50%) showed the lowest prevalence. An association was found between methamphetamine use and OHIP prevalence ($p < 0.005$). The odds of a negative impact on oral health were 1.8 times more among methamphetamine users compared to those who did not use methamphetamine as a primary drug.

The prevalence of a negative impact on OHRQoL of the different dimensions of the OHIP-14 instrument was analysed according to main primary drug groups. The highest negative impact on OHRQoL was felt by opiate users reporting feeling

Table 4: OHIP prevalence according to primary drug use

		OHIP prevalence*		OR	RR	p-value
Main primary drug		Yes	No			
Alcohol	Yes	47 (46%)	55	0.5	0.7	< 0.005
	No	261	141			
Cannabis	Yes	28 (62%)	17	1.1	1.0	> 0.05
	No	280	179			
Heroin/Opiates	Yes	20 (80%)	5	2.7	1.3	> 0.05
	No	288	191			
Mandrax	Yes	26 (50%)	26	0.6	0.8	> 0.05
	No	282	170			
Methamphetamine	Yes	175 (68%)	84	1.8	1.2	< 0.005
	No	133	11			
Entire sample		61%				

*: A binary measure of the proportion of at least one "fairly often" or "very often" response

Table 5: OHIP prevalence of categories for OHIP-14 dimensions according to main primary drugs

	Main primary drug groups (n = 484)*					n = 504
	Alcohol n (prevalence in %)	Cannabis	Mandrax	Opiates	Meth	Total sample
FUNCTIONAL LIMITATION						112 (22%)
1. Trouble pronouncing words	<u>6 (6%)</u>	7 (16%)	9 (17%)	1 (4%)	34 (13%)	<u>57 (11%)</u>
2. Worsened taste	5 (5%)	10 (22%)	9 (17%)	6 (24%)	59 (23%)	91 (18%)
PHYSICAL PAIN						206 (41%)
3. Painful aching in mouth	<u>20 (19%)</u>	12 (27%)	15 (29%)	13 (52%)	91 (35%)	155 (31%)
4. Discomfort eating food	<u>24 (23%)</u>	16 (26%)	17 (33%)	13 (52%)	93 (36%)	167 (33%)
PSYCHOLOGICAL DISCOMFORT						212 (42%)
5. Feeling self-conscious	<u>22 (21%)</u>	21 (47%)	17 (33%)	15 (60%)	100 (39%)	184 (37%)
6. Feeling tense	<u>23 (22%)</u>	14 (31%)	15 (29%)	13 (52%)	84 (32%)	154 (31%)
PHYSICAL DISABILITY						145 (29%)
7. Poor diet	<u>10 (10%)</u>	10 (22%)	13 (25%)	5 (20%)	63 (24%)	103 (20%)
8. Interrupted meals	<u>13 (13%)</u>	9 (20%)	16 (31%)	7 (28%)	73 (28%)	119 (24%)
PSYCHOLOGICAL DISABILITY						201 (40%)
9. Difficult to relaxing	<u>16 (16%)</u>	12 (27%)	14 (27%)	5 (20%)	76 (29%)	126 (25%)
10. Embarrassed	26 (25%)	17 (38%)	19 (37%)	11 (44%)	102 (39%)	181 (36%)
SOCIAL DISABILITY						155 (31%)
11. Irritable with other people	<u>15 (15%)</u>	11 (24%)	19 (37%)	7 (28%)	83 (32%)	137 (27%)
12. Difficulty doing usual jobs	<u>9 (9%)</u>	9 (20%)	14 (27%)	5 (20%)	52 (20%)	91 (18%)
HANDICAP						129 (56%)
13. Life less satisfying	<u>13 (13%)</u>	13 (29%)	13 (25%)	3 (12%)	66 (25%)	112 (22%)
14. Totally unable to function	6 (6%)	5 (11%)	7 (13%)	<u>0 (0%)</u>	40 (12%)	<u>60 (12%)</u>

*: The main drug groups are the most common drugs being used and represent 96% of the sample (n = 484/504 = 96%)

self-conscience (60%), feeling tense (52%), having a painful aching in the mouth (52%) and having discomfort when eating food (52%) due to problems with their teeth mouth or dentures. Those who were using mandrax reported the highest negative impact related to trouble pronouncing words (17%), poor diet (25%), interrupted meals (31%), irritable with other people (37%), difficulty doing usual jobs (27%) and unable to function at all (13%). Those who used alcohol as a primary drug reported the lowest negative impact for most categories. The values below that are underlined indicates the lowest value in each row while the

values that are in bold indicated the highest (Table 5)
The OHIP-14 score was also analyzed according to categories of dental caries severity (DMFT) as well as to the patients who presented with active caries (D > 0) and those who suffered from dental caries (DMFT-score > 0). Those with a DMFT score of 7 and less, had shown an OHIP-14 score of 12.65 which was significantly lower than the rest of the sample.

Dental caries severity and OHRQoL

Mean DMFT score was analyzed according the OHIP prevalence. All the questions, where a negative impact was

Table 6: OHIP-14 score (severity) and dental caries status of the sample

Dental caries status and OHIP-14 score		OHIP-14 total score						p-value
		n	%	mean	median	SD	IQR	
DMFT	0 – 7	138	27	12.65	8	13.3	2 – 20	< 0.0005
	8 – 14	161	32	18.60	17	15.0	6 – 28	
	15 – 21	123	24	22.46	20	14.9	11 – 34	
	> 21	82	16	24.88	24	16.7	11 – 40	
Active caries (untreated tooth decay)	Yes	439	87	19.71	18	15.2	6 – 30	< 0.005
	No	65	13	13.72	8	16.1	1 – 24	
Caries prevalence (caries experience) #	Yes	492	98	19.19	17	15.4	5 – 30	< 0.05
	No	12	2	8.67	2	11.5	0 – 18.5	

: D > 0; also referred to as active caries (untreated tooth decay)

#: DMFT > 0; also referred to as caries experience (%)

Table 7: DMFT score according to presence of negative impact on OHRQoL

Presence of negative impact on OHRQoL over the preceding 12 months			DMFT total score					p-value	
n	%		mean	median	SD	IQR			
Functional limitation	1. Trouble pronouncing any words because of problems with your teeth, mouth or dentures?	Yes	57	11	17.61	17	7.2	13 – 23	< 0.0005
		No	447	89	12.67	12	7.6	7 – 18	
	2. Sense of taste has worsened because of problems with your teeth, mouth or dentures?	Yes	91	18	14.62	14	7.8	8 – 20	> 0.05
		No	413	82	12.92	12	7.7	7 – 18	
Physical pain	3. Had painful aching in your mouth?	Yes	155	31	15.15	15	7.2	9 – 20	< 0.0005
		No	349	69	12.37	11	7.8	7 – 17	
	4. Found it uncomfortable to eat any foods because of problems with your teeth, mouth or dentures?	Yes	167	33	15.78	16	7.5	10 – 21	< 0.0005
		No	337	67	11.96	11	7.6	6 – 17	
Psychological discomfort	5. Been self-conscious because of your teeth, mouth or dentures?	Yes	184	37	15.05	15	7.5	9 – 21	< 0.0005
		No	320	63	12.18	11	7.7	6 – 17	
	6. Felt tense because of problems with your teeth, mouth or dentures?	Yes	154	31	15.15	15	7.4	9 – 21	< 0.0005
		No	350	69	12.38	11	7.8	7 – 17	
Physical disability	7. Diet been unsatisfactory because of problems with your teeth, mouth or dentures?	Yes	103	20	16.44	16	7.6	10 – 23	< 0.0005
		No	401	80	12.40	11	7.6	7 – 17	
	8. Had to interrupt meals because of problems with your teeth, mouth or dentures?	Yes	119	24	16.60	16	7.4	10 – 23	< 0.0005
		No	385	76	12.18	11	7.6	7 – 17	
Psychological disability	9. Found it difficult to relax because of problems with your teeth, mouth or dentures?	Yes	126	25	15.69	16	7.6	9 – 21	< 0.0005
		No	378	75	12.40	11	7.6	7 – 17	
	10. Been a bit embarrassed because of problems with your teeth, mouth or dentures?	Yes	181	36	15.58	15	7.4	10 – 21	< 0.0005
		No	323	64	11.76	11	7.6	6 – 17	
Social disability	11. Been a bit irritable with other people because of problems with your teeth, mouth or dentures?	Yes	137	27	16.06	15	7.4	10 – 21	< 0.0005
		No	367	73	12.17	11	7.6	6 – 17	
	12. Life in general was less satisfying because of problems with your teeth, mouth or dentures?	Yes	91	18	15.96	15	7.4	10 – 22	< 0.0005
		No	413	82	12.62	12	7.7	7 – 17	
Handicap	13. Felt that life in general was less satisfying because of problems with your teeth, mouth or dentures?	Yes	112	22	16.01	16	7.8	9 – 22	< 0.0005
		No	392	78	12.43	12	7.6	7 – 17	
	14. Been totally unable to function because of problems with your teeth, mouth or dentures?	Yes	60	12	15.88	16	6.9	11 – 21	< 0.005
		No	444	88	12.87	12	7.8	7 – 18	

Risk predictors for OHRQoL

felt by the participants on their OHRQoL in the preceding 12 months, had a significant higher (< 0.005) mean DMFT score except for the question of a worsened sense of taste (Table 7).

A multivariate regression analysis for OHIP-14 score as the outcome variable was done on: age, sex, cigarette smoking, DMFT score, poly-drug use, highest school grade completed, number of extractions needed, frequency of drug

use, having periodontal health, having active caries, duration of addiction, and having a medical condition. Nearly a fifth of the variability in the OHIP score was explained by the combined effect of the predictors. Cigarette smoking, DMFT, poly-drug use, highest school grade completed, the number of dental extractions needed, having active caries and having a medical condition were significant predictor variables ($p < 0.05$) (Table 8).

DISCUSSION

The present study is unique with regards to its primary focus on the impact substance use disorder (SUD) has on oral health status (dental caries and periodontal disease) and OHRQoL. The prevalence of impact on OHRQoL of 61%, among substance users, was much higher than 17.5% that was found among the general South African adult population (Ayo-Yusuf et al., 2016). Mukerjee et al. (2018) found that more than half (59%) methamphetamine users reported a painful aching in the mouth, discomfort while eating (63.5%), feeling embarrassed (60.7%) and avoidance of particular foods (56.5%). These findings were slightly higher than the present study, probably on account of different sample distribution. The present study reported on other drug types including alcohol (20% of the sample) and found lower negative impact on OHRQoL. On the other hand, Brown et al. (2021) investigated DMFT- and OHIP-14 scores of 398 psychoactive substance users in Brazil. The results on OHIP-14 severity for almost all the dimensions concurred with the present study. Only the mean OHIP-14 score for psychological discomfort was much higher than the present study (5.0 vs 3.4) and this could be attributed to the fact that the Brown study was done at psychiatric hospitals (Brown et al., 2021). The relationship between dental caries and OHRQoL was also investigated in the present study with those who had a high DMFT score (15 and more) having a worse OHRoL than those with a lower DMFT score (14 and less) ($p < 0.0005$). This finding also concurred with Brown et al. (2021). In the present study, oral health status encompassed the severity and prevalence of dental caries and periodontal disease as well as specific oral health symptoms that were experienced during substance use. Symptoms included grinding teeth, experiencing dental pain, gum problems, stiff facial muscles, a bad taste, a burning sensation in the mouth, increased tooth sensitivity and a dry mouth.

CONCLUSION

The present study highlighted the drug-specific oral health impacts of SUD. The study found that OHRQoL dental status and oral health behaviour is poor among SUD patients. The study considered a multifactorial cascade of risk predictors

related to the socio-demographic profile, history of substance use and oral health behaviour of the patient. Evidence from published literature and an in-depth analysis was incorporated in this model to explain the different contributing factors towards poor oral health of the patient who suffers from SUD.

RECOMMENDATIONS

It is recommended that prior to and during enrolment of patients with SUD the following factors need to be considered: access to oral health care, oral health pre-admission screening, the referral process, oral health profession collaborative partnership, oral health education and behaviour, staff training, nutrition and food products at tuckshops. Dental management should be aligned with substance use treatments and it is recommended that this is done at the initial stage of admission. Pre-admission screening will permit staff to refer the patient for appropriate care. Furthermore, if urgent dental treatment is needed, it can be addressed prior to admittance. A clear referral process must be available during treatment and will require coordination with local private and public dental clinics. Staff at the treatment centre should be aware of the referral channels and processes. Health and oral health education and promotional material needs to be available at all SUD treatment centres. Healthy food choices and educating patients on the association between high sugar intake and dental caries should be included in oral health education material.

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CPD questionnaire on page 122

The Continuing Professional Development (CPD) section provides for twenty general questions and five ethics questions. The section provides members with a valuable source of CPD points whilst also achieving the objective of CPD, to assure continuing education. The importance of continuing professional development should not be underestimated, it is a career-long obligation for practicing professionals.

