

Oral Health-Related Quality of Life (OHRQoL) of Oral Squamous Cell Carcinoma (OSCC) patients



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**A mini-thesis submitted in partial fulfilment of the requirements for
the Master of Science degree in Dental Public Health**

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2021

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DEDICATION

To my precious parents, Abdelkarim and Hanan for their endless love and support, your belief in me is what keeping me moving. God bless you

To my sisters, Fayha, Isra and Lamis for their love, support and sacrifices. Thank you very much.

To my best friends, Sarah and Mohamed for their constant love, support and motivation. Thank you very much, without you this wouldn't be the way it is.



ACKNOWLEDGEMENTS

I would like to thank:

- My Supervisor Prof Dirk Smit for his expertise, guidance, encouragement and support throughout this journey, without you this work would not have seen the light.
- The Department of Community Oral Health: Prof Neil Myburgh, Prof Rob Barrie and staff members.
- Dr Faheema Kimmie-Dhansay for her patience and constant support and guidance.
- The Department of Radiation Oncology staff for opening their doors and offices for me – your help and assistance made the data collection process very informative and enjoyable.
- My friends and colleagues for their constant support, care and help.



DECLARATION

I, the undersigned, declare that, this thesis has been completed by me and it is my original work and has not been copied from elsewhere. Also, it has not been submitted for any kind of examination or degree at any other university.

All sources quoted and used have been marked and acknowledged by complete references.



Mohamed Elsheikh



Date

November 2021

LIST OF ABBREVIATIONS

| Terms | Abbreviations |
|-------------------------------------|---------------|
| Floor of Mouth | FOM |
| Head and Neck Cancer | HNC |
| Health-Related Quality of Life | HRQoL |
| Oral Health Impact Profile – 14 | OHIP-14 |
| Oral Health-Related Quality of Life | OHRQoL |
| Oral Squamous Cell Carcinoma | OSCC |
| Quality of Life | QoL |
| Statistically Significant | SS |
| Standard Deviation | SD |



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KEY WORDS

- Oral cancer
- Oral Squamous Cell Carcinoma (OSCC)
- Oral Health-Related Quality of Life (OHRQoL)
- Oral malignancy
- Head and neck cancer



ABSTRACT

Introduction: Oral Squamous Cell Carcinoma (OSCC) patients suffer from the terrible consequences of the disease and its treatment modalities, and as a result, their Quality of Life (QoL) and Oral Health-related Quality of Life (OHRQoL) is badly affected, especially due to functional limitation, physical disability and psychological disability that they encounter before, during and after treatment. There is a need for more research on OHRQoL of OSCC patients at various treatment intervals. The present study focused on investigating OHRQoL of OSCC patients at the post-treatment phase.

Literature review: Oral cancer is one of the most common and challenging cancers in the head and neck region with an estimated global incidence of 263 000 new cases every year (Tsakos *et al.*, 2014; Indrapriyadharshini *et al.*, 2018). The most common type of oral cancer is Squamous Cell Carcinoma (SCC) which arises from the mucosal epithelium of the mouth and accounts for 90% of all oral cancers (Tsakos *et al.*, 2014). In South Africa, OSCC is considered to be the fifth most common cancer among males and the tenth among females (Botha *et al.*, 2018). The treatment of oral cancer is mostly debilitating and disfiguring which disrupts the patient's daily activities such as eating, speaking, and interacting with others. Therefore, it is associated with physical and psychological challenges and as a result, patients tend to have a poor Quality of Life (QoL) and poor Oral Health-Related Quality of Life (OHRQoL) (Hassel *et al.*, 2012; Moore *et al.*, 2014; Tsakos *et al.*, 2014; Indrapriyadharshini *et al.*, 2018). OHRQoL can be measured by social indicators, global self-rating or multi-item questionnaires with the latter being the most appropriate and accurate (Klassen *et al.*, 2017). These questionnaires can be generic or specific to certain dimensions such as dental anxiety, certain conditions such as oral cancer or assessing certain populations such as geriatric patients (Shamrany, 2006; Klassen *et al.*, 2017).

Aim and Objectives: The aim of the study was to investigate the Oral Health-Related Quality of Life (OHRQoL) of patients who suffered from Oral Squamous Cell Carcinoma (OSCC), post-treatment. The objectives were to describe the demographic profile of the sample, determine the OHRQoL of OSCC patients who presented for their follow-up visits, to summarize the treatment

history for OSCC including the type and duration of treatment received and to describe the clinical aspects of the tumour including staging, location and oral symptoms at diagnosis.

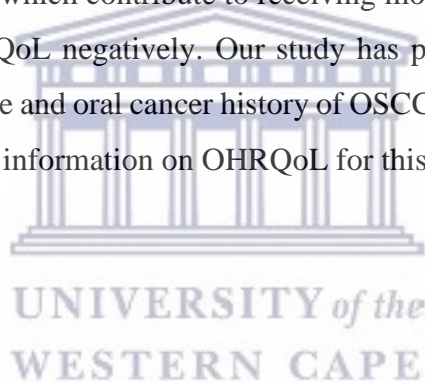
Material and Methods: A cross-sectional study was conducted at Tygerberg Hospital, Cape Town, South Africa, at the Department of Radiation Oncology. A convenience sample of 50 participants were included who were attending their follow-up visits. Only patients who completed their treatment, three months or longer from the date of data collection, were included. The English short version of Oral Health Impact Profile (OHIP-14) was used in this study to measure Oral Health-Related Quality of Life (OHRQoL). Basic descriptive analysis was done using Microsoft Excel 10 while more complex analysis was done using Stata/IC 16. The research proposal was approved by the Biomedical Research Ethics Committee of the University of the Western Cape. Further research approval was also obtained from the Western Cape Department of Health. Participation was voluntary and anonymous and signed informed consent was obtained from each patient.

Results: The majority of the participants were males (60%) and the mean age of this study population was found to be 58.56 years old. The most reported site of OSCC was the tongue (30% of the sample) while well-differentiated tumour grade was the most observed among participants (78%). The mean OHIP-14 score was 22.92 with physical pain being the most impaired dimension. Regarding treatment received, the highest OHIP-14 mean score among the participants were among those who had surgery, radiation and chemotherapy in combination. Cancer staging categories also had a difference in regards to the means score of psychological discomfort and social disability dimensions ($p = 0.005$, $p = 0.04$) respectively. These were statically significant. The mean difference of OHIP-14 score between treatment types categories in regards to psychological discomfort was also statistically significant with a p-value of 0.02.

Discussion: Regarding participants' perceived OHRQoL, all the demographic variables showed no statistically significant differences among their categories, despite the study done by Khandelwal *et al* who found a minor impact on QoL caused by age (Khandelwal *et al.*, 2017). One explanation for the absence of this finding in our study is that our study population was mostly centred among geriatrics. Although the impact found in OHRQoL is moderate in some studies,

this area of research deserves more. In developing countries, the problem of delayed reporting of oral cancer to health-care facilities is one of the main causes of patients being diagnosed at late stages (Khandekar *et al.*, 2006). In spite of the accessibility of the oral cavity for clinical examination, most patients tend to delay their visit due to lack of awareness or ignorance (Khandelwal *et al.*, 2017). Our findings support this finding as 32% were in stage III and 40% of our participants were in stage IV, both of them are late oral cancer stages which agrees with studies that suggest that approximately 80% of Head and Neck Cancers (HNC), of which oral cancer is included. Patients in developing countries mostly present in stage III and IV (Khandelwal *et al.*, 2017).

Conclusion: The results of this study showed that patients with OSCC in Tygerberg Hospital are usually diagnosed at a late stage which contribute to receiving more than one treatment modality. Subsequently, this affects OHRQoL negatively. Our study has provided a better understanding regarding the demographic profile and oral cancer history of OSCC patients in Tygerberg Hospital in addition to providing baseline information on OHRQoL for this particular patient group.



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1. INTRODUCTION

Our daily lives and well-being are hugely affected and influenced by the status and quality of our oral health. Oral health is influenced by a multitude of factors including daily activities such as tooth brushing, diet and personal habits (Abram, 2013). An important fact that has to be stated is that oral health is not just the absence of disease or loss of function but rather a more multifaceted concept that involves many factors and dimensions (Abram, 2013).

In terms of severe morbidity and high mortality, oral cancer is the most important oral disease and it is ranked as the sixth most common cancer nowadays, with Oral Squamous Cell Carcinoma (OSCC) being the 10th most common human malignancy (Hassel *et al.*, 2012). Moreover, it is more common in developing than developed countries (Abram, 2013). Unfortunately the prevalence of oral cancer is still increasing annually (Siegel *et al.*, 2014) despite improved treatment modalities. Therefore, patients tend to live longer than before (Jemal *et al.*, 2008), which means patients will have to live with the negative effects of the disease and side effects of treatments. Subsequently, their Quality of Life (QoL) will be affected.

The importance of the oral cavity must be emphasized in its contribution to verbal and non-verbal communication, nutritional intake and a person's appearance (Bhalla *et al.*, 2015). All these important factors contribute directly to QoL and a deformity will affect it immediately. Therefore, QoL and Oral Health-Related Quality of Life (OHRQoL) have received more attention in the medical field and have become an important and valuable tool in measuring treatment outcomes while also playing an integral part in the evaluation of oral health programmes (Barkokebas *et al.*, 2015).

OHRQoL is a specific measure developed for the oral cavity and can be applied as a tool, that is compatible with the complex three-dimensional anatomy of the oral cavity, to capture the impact of oral conditions and diseases on an individual's daily life and habits (Barrios *et al.*, 2015). When studying oral cancer patients, OHRQoL questionnaires are invaluable for investigating how patients are coping with the changes caused by the disease and its treatment (Sherman & Simonton, 2010). Different studies have been conducted to compare OHRQoL scores of cancer patients to

population norms and most of their results were inconclusive. Some researchers found the OHRQoL to be worse compared to the general population, while others found it to be the same or even better (Barrios *et al.*, 2015).

An investigation of the OHRQoL of patients living with OSCC, will evaluate the interventions and treatment offered to these patients, consequently contributing to improving treatment and prognosis (Barkokebas *et al.*, 2015). In developing countries, including South Africa, OHRQoL measurement is not performed routinely despite the proven benefits of this instrument.

This study aimed to assess the OHRQoL of OSCC patients' after receiving treatment to include the effects of OSCC and its treatment on OHRQoL. The motivation for the study was to assist health managers and health professionals to incorporate better treatment plans that focus equally on treating the patient and providing a better quality of life after treatment.



2. LITERATURE REVIEW

2.1 Introduction

Oral cancer is one of the most common and challenging cancers in the head- and neck region with an estimated global incidence of 263 000 new cases every year (Tsakos *et al.*, 2014; Indrapriyadharshini *et al.*, 2018). In South Africa, oral cancer and oropharyngeal cancer account for 5% and 0.6% of all cancers in males and 0.6% and 0.1% in females, respectively. It is also more prevalent among urban than rural communities (Botha *et al.*, 2018). In South Africa, the five-year prevalence rate oral cancer is 5.15/100,00/5 years (Hille & Johnson, 2017). The estimated global five-year survival rate of oral cancer is 50% (Moore *et al.*, 2014) with the highest mortality during the first two years (Cawson & Odell, 2002).

This disease presents in many locations in the mouth, but the most frequently reported site is the lower lip, floor of the mouth and the lateral borders of the tongue. Cawson and Odell reported that 70% of oral cancers are concentrated on the lateral borders of the tongue, adjacent floor of the mouth and lingual aspects of the alveolar margin (Cawson & Odell, 2002).

Oral cancer is mostly an age-related disease, and patients over 40-years-old account for 98% of all patients, the majority of them, diagnosed at the end of their sixth decade (Botha *et al.*, 2018). Its incidence is greater in men than in women in most countries. Until the present day, it is not possible to confirm aetiology, but the risk factors are well known. They are categorized into possible carcinogens such as tobacco, alcohol and areca nut; infections like syphilis, candidiasis and the human papillomavirus (HPV), mucosal diseases e.g., lichen planus and submucous fibrosis, genetic disorders and lip exposure to direct sunlight.

Oral cancer shares many risk factors with other Head and Neck cancers (HNC). As a result, the term “Head and Neck cancer” excluding nasopharyngeal carcinoma, is sometimes used to describe oral cancer (Moore *et al.*, 2014).

The most common type of oral cancer is Oral Squamous Cell Carcinoma (OSCC) which arises from the mucosal epithelium of the mouth and accounts for 90% of all oral cancers (Tsakos *et al.*, 2014). In South Africa, OSCC is considered to be the fifth most common cancer among males and the tenth among females (Botha *et al.*, 2018).

2.2 Clinical features of OSCC

The clinical presentation of OSCC varies according to the stage of progression of malignancy. OSCC appears in its early stages as painless red, speckled or white patches and ulceration is not common at such an early stage. In later stages, it either enlarges into a raised nodule or ulcerates. As the disease progresses toward the later stage, some specific symptoms such as stinging pain, soreness and bleeding during clinical examination appear. These symptoms could happen spontaneously or due to mild trauma, and the prognosis of OSCC at this late stage is extremely poor (Cawson & Odell, 2002; Scully, 2013).

OSCC invades adjacent structures by direct tissue infiltration as well as the regional lymph nodes at the early stages and then continues to spread. Metastasis primarily occurs through the lymphatic system and it is uncommon for it to metastasize by blood. The site of the tumour is the main determinant of the metastatic drainage and submandibular and jugulodigastric lymph nodes are the most commonly affected nodes. This is mainly due to the increased prevalence of OSCC in the posterior part of the mouth (Cawson & Odell, 2002; Scully, 2013).

2.3 Diagnosis and treatment of OSCC

Early diagnosis is a crucial step in treating OSCC and this is mainly done by taking a biopsy for histopathological examination under a microscope. Thereafter, OSCC should be staged according to Tumour, Node, and Metastasis (TNM) classification to determine the cancer prognosis and survival rate (Scully, 2013). Table 1 and 2 show the TNM classification and Cancer staging based on it (Scully, 2013, p. 210).

| | |
|---|--|
| Primary tumour size (T) | Tx, No available information. |
| | T0, No evidence of primary tumour. |
| | Tis, Only carcinoma in situ. |
| | T1, T2, T3, T4, Increasing size of tumour*. |
| Regional lymph node involvement (N) | Nx, Nodes could not be or were not assessed. |
| | N0, No clinically positive nodes. |
| | N1, Single clinically positive homolateral node <3cm in diameter. |
| | N2, Single clinically positive homolateral node 3-6cm in diameter, or multiple clinically positive homolateral nodes, none >6cm in diameter. |
| | N2a, Single clinically positive homolateral node 3-6cm in diameter. |
| | N2b, Multiple clinically positive homolateral nodes, none >6cm in diameter. |
| | N3, Massive homolateral node(s). |
| | N3a, Clinically positive homolateral node(s), one >6cm in diameter. |
| | N3b, Bilateral clinically positive nodes. |
| N3c, Contralateral clinically positive node(s). | |
| Involvement by distant metastases (M) | Mx, Distant metastasis was not assessed. |
| | M0, No evidence of distant metastasis. |
| | M1, M2, M3, Distant metastasis is present. Increasing degrees of metastatic involvement, including distant nodes. |

*T1, maximum diameter 2cm. T2, maximum diameter 4cm. T3, maximum diameter >4cm. T4, massive tumour >4cm diameter with involvement of antrum, pterygoid muscles, base of tongue or skin.

Table 1: Cancer TNM Classification (Scully, 2013)

| Stage | TNM | | |
|-------|------------|------------|----|
| 0 | Tis | N0 | M0 |
| I | T1 | N0 | M0 |
| II | T2 | N0 | M0 |
| III | T1, T2 | N1 | M0 |
| | T3 | N0, N1 | M0 |
| IVa | T1, T2, T3 | N2 | M0 |
| | T4a | N0, N1, N2 | M0 |
| IVb | Any T | N3 | M0 |
| | T4b | Any N | M0 |
| IVc | Any T | Any N | M1 |

Table 2: Cancer Stage Grouping (Scully, 2013)

In 1920, a broader classification was made of OSCC, histopathologically, with three different grades ranging from well-differentiated to poorly differentiated, with the latter being more difficult to treat and having a poor prognosis (Cawson & Odell, 2002; Scully, 2013). Well-differentiated carcinomas have elongated rete pegs invading lamina propria with some keratin pearls. Moderately-differentiated carcinomas are the second grade and show some irregular invading rete pegs with loss of cellular cohesion. Lastly, poorly-differentiated carcinomas show sheets of invading epithelium with no obvious architecture with severe cellular abnormalities such as hyperchromatism and pleomorphism (Scully, 2013).

The choice of treatment depends on the cancer type, the site, stage, grade and metastasis. The patient's general health also plays an important role in treatment planning and decision making (Indrapriyadharshini *et al.*, 2018). OSCC management should be started by reassuring the patient and comforting him/her to reduce any possible psychological/emotional distress. After that, the treatment plan is tailored for each case following the specific above-mentioned parameters for either surgical treatment, radiotherapy, chemotherapy or a multi-modality treatment approach (Scully, 2013). Cancer care planning is a multidisciplinary process including medicine, cardiology, respiratory, dental, psychological, anaesthetic and palliative advice, in addition to speech and language therapy for some patients and dietary advice (Scully, 2013).

The rationale for surgical treatment of oral cancer patients is either to remove a tumour, to establish whether neck dissection is needed through sentinel lymph node biopsy, reconstruction, debulking in large tumours or palliation. Excision of cancer with free margins is the main surgery performed to remove tumours while a neck dissection may be required to clear lymph nodes containing cancer cells. There are three types of neck dissections, namely, radical, modified and selective, that can be considered to remove lymph nodes and affected structures during surgery. One of the innovations in the surgery field is transoral laser microsurgery which is used in tumour resection with organ preservation (Scully, 2013).

Radiotherapy could be used solely or as an adjunct to other modalities and can be offered in different types such as external beam (linear accelerators that produce x-rays of increasingly greater energy, intensity-modulated radiotherapy and intensity graded radiotherapy), particle beam

radiation (modulated proton therapy), and finally internal radiotherapy (brachytherapy and interstitial irradiation) (Scully, 2013).

Chemotherapy in oral cancer has been restricted by adverse effects. However, in advance cancer stages, radiotherapy sometimes include chemotherapy. The most common used are cisplatin and cetuximab. Other used drugs include carboplatin, paclitaxel and fluorouracil (Scully, 2013).

The term chemoradiotherapy is used when systemic chemotherapy is administered with radiotherapy, it could be either before (induction or neoadjuvant chemotherapy), during concomitant chemotherapy or after adjuvant chemotherapy (Scully, 2013).

2.4 OSCC & Quality of Life

The treatment of oral cancer is mostly debilitating and disfiguring which disrupts the patient's daily activities such as eating, speaking, and interacting with others. Therefore it is associated with physical and psychological challenges and as a result, patients tend to have a poor Quality of Life (QoL) and poor Oral Health-Related Quality of Life (OHRQoL) (Hassel *et al.*, 2012; Moore *et al.*, 2014; Tsakos *et al.*, 2014; Indrapriyadharshini *et al.*, 2018).

The World Health Organization (WHO) defines Health as “a complete state of physical, mental, and social well-being and not just the absence of disease” (WHO, 2006). Moreover, Quality of Life is defined as an “individual's perceptions of their position in life in the context of culture and value systems in which they live, and in relation to their goals, expectations, standards and concern” (Kuyken, 1995). QoL is a broad concept that involves several domains that cannot be easily captured by a single measurement, therefore, researchers had to come up with more specific terms such as Health-Related Quality of Life (HRQoL) and Oral Health-Related Quality of Life (OHRQoL) (Indrapriyadharshini *et al.*, 2018).

The uncertainty of oral cancer prognosis remains an issue despite all the new improvements in treatment such as microvascular reconstructive surgical techniques and radiotherapy improvements. This was one of the reasons for raising the idea of measuring QoL and using more

self-administered questionnaires in evaluating OHRQoL according to each patient's case to provide a better measure of QoL (Indrapriyadharshini *et al.*, 2018).

According to the United States Surgeon General's report, OHRQoL is "a tridimensional" construct that reflects (among other things) people's comfort when eating, sleeping and engaging in social interaction, their self-esteem, and their satisfaction concerning their oral health" (Shamrany, 2006; Klassen *et al.*, 2017). In 2003, the WHO listed OHRQoL as an element of the global oral health programme (Shamrany, 2006).

2.5 Effects of OSCC on Oral Health-Related Quality of Life (OHRQoL)

The most commonly cited impacts of oral cancer occurrence coupled with treatments applied were categorized mainly into functional limitations, physical discomfort, psychological disability, nutritional difficulties and aesthetic disfigurements.

K.A. Moore *et al* (2014) reviewed the literature to describe the impact of oral cancer on QoL and to provide an evidence-base for oral cancer patients' support needs such as physical and psychological support. They found that some issues related to pain, xerostomia, taste disturbances, eating difficulty and mucositis are more prominent in the acute treatment period of radiotherapy and chemotherapy, although, after six months of treatment, patients reported the same issues. One to 5 years after primary or adjunct radiotherapy treatment, patients reported a clinically significant deterioration in sticky saliva (Moore *et al.*, 2014). This is in contrast to findings by Chandu *et al.* (2006) who investigated the effect of post-surgical treatment on patient QoL, and concluded that patients had high QoL scores three months after treatment, after which it declined to approach pre-operative scores at one-year time intervals. The scoring system is designed in a way that a high QoL score actually means that the patient has a poorer quality of life and versa visa.

In the included studies, dysphagia was also a significant issue for patients undergoing radiotherapy, and swallowing was ranked number 6 out of the total 45 concerns that patients wished to discuss with their doctors. Lack of functional units as natural or prosthetic teeth was among the most reported concerns of patients as it affects their eating process. These two issues are the most

common nutritional related problems arising from oral cancer which lead to nutritional compromise and as a result poor QoL (Moore *et al.*, 2014).

The psychological impact of OSCC on the patient can be described as the traumatic experience of patient when receiving the diagnoses which manifests as psychological symptoms such as anxiety or fear of the unknown or uncertain future (Valdez & Brennan, 2018).

Moore *et al* (2014) also mentioned that depression is a common mental health disorder among OSCC survivors. One reviewed study reported that patients experienced more distress at follow-up visits than at the time of diagnosis. Patients who wished to consult a psychologist obtained lower QoL scores. One study found a negative association between QoL, functional impairment and poor coping mechanisms, such as alcohol use, which were associated with depressive symptoms up to 12 months after treatment.

Depression was found to have a negative effect on oral cancer patients due to the loss of interest of these patients to complete the prescribed treatment plan. This led to a longer hospitalization and less self-care, which influencing mortality and morbidity.

According to their study on OSCC patients, at least 39 months after treatment, Hassel *et al* (2012) found that OHRQoL predicted psychological illness, particularly anxiety and depression.

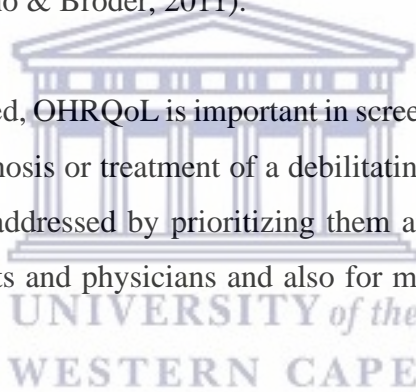
The aesthetic impact caused by surgical removal of parts of the face to remove cancerous tissue may lead to patients isolating themselves and developing social and communication problems. These problems are mainly solved by reconstructive surgeries and prostheses to restore appearances and functions and to assist in enhancing patients' self-esteem.

The above-mentioned paragraphs are evidence of the negative effect of cancer on patients' QoL and OHRQoL. Measuring OHRQoL, specifically personal, social- and emotional experience and physical functioning with regards to oral health, will assist in better treatment planning and setting of appropriate goals and outcomes according to the patient's state (Sischo & Broder, 2011).

From a public health perspective, OHRQoL has implications for oral health disparities and access to care (Sischo & Broder, 2011). Therefore, it is an effective tool in delivering optimum communication to policy-makers and it assists in negotiating health care access (Shamrany, 2006). This point has also been mentioned by Bennadi and Reddy (2013) who added that OHRQoL was a useful tool to plan welfare policies because it determines population needs and priorities (Klassen *et al.*, 2017).

Sischo and Broder stated that an OHRQoL assessment might assist with identifying a patient's strengths and weaknesses. This could be useful in planning other service programmes and then testing these programs by using OHRQoL as a measure. For example, if elder patients were found to have psychological deficits, psychological adjunct service programmes can be included in community-based projects (Sischo & Broder, 2011).

In addition to the above-mentioned, OHRQoL is important in screening for hidden health problems that are associated with the diagnosis or treatment of a debilitating disease such as OSCC. These hidden health problems can be addressed by prioritizing them and therefore improving clinical decision making between patients and physicians and also for monitoring patients' responses to treatment (Klassen *et al.*, 2017).



2.6 Measurement of OHRQoL

OHRQoL can be measured by social indicators, global self-rating or multi-item questionnaires. The latter, being the most appropriate and accurate (Klassen *et al.*, 2017). These questionnaires can be generic or specific to certain dimensions such as dental anxiety, certain conditions such as oral cancer or assessing certain populations such as geriatric patients (Shamrany, 2006; Klassen *et al.*, 2017).

One disadvantage of using generic questionnaires over specific ones is that it may enquire about irrelevant symptoms of the condition or disease under assessment, such as assessing body discomfort in dental implant patients instead of inquiring about oral pain (Sischo & Broder, 2011). Also, the specificity helps in addressing age-related conditions (Sischo & Broder, 2011).

These questionnaires have to be valid, appropriate, acceptable, reliable and easily interpreted. Most of them are reported as a score that shows the severity of the outcome or the disease (Klassen *et al.*, 2017).

One of the most popular questionnaires used in assessing OHRQoL is the Oral Health Impact Profile (OHIP). The original version was developed by Slade and Spenser (1994), which consists of 49 questions, a shorter version has been developed which contains only 14 questions. This questionnaire measures seven different dimensions (functional limitations, physical pain, psychological discomfort, physical, psychological and social disability, and other handicaps) (Khalifa *et al.*, 2013). Participants respond to each one of the above-mentioned items by selecting the frequency of impact on a 5-point Likert scale. The options are (never = 0, hardly ever = 1, occasionally = 2, fairly often = 3, and very often = 4). The overall OHIP-14 score ranges from 0 to 56 with higher scores indicating poorer OHRQoL (Barrios *et al.*, 2015; Agrawal Koirala & Shrestha, 2017).

One study conducted in Spain (Granada) examined the association between OHRQoL and malnutrition status in a population of patients treated for OSCC and oropharyngeal cancer after a month of treatment. They used the OHIP-14 and Oral Impact of Daily Performance (OIDP) to assess OHRQoL, and the Mini Nutritional Assessment (MNA) to measure nutritional status. They found that patients at risk of developing malnutrition tend to have worse OHRQoL scores than those with adequate nutrition.

Barrios *et al* (2015) also did another study to assess Health-related Quality of Life (HRQoL) and OHRQoL of oral cancer patients 6 months after treatment and compared them to a disease-free population. The sample sizes were 142 cases and 142 controls, and all of them were free of recurrence. To assess HRQoL, they used the Short Form (SF-12) survey, which consists of 12 questions. OHIP-14 and OIDP were used to assess OHRQoL. Regarding the SF-12 results, there was a significant difference between the two groups in terms of physical role, bodily pain and general health domains; on the other hand, patients had poor scores in all domains of OHIP-14 and OIDP.

OHRQoL scores showed a moderate difference between the general Spanish population and cancer patients in physical domains, but showed a severe difference in OHRQoL generally, with a few patients achieving psychological adaptation (Barrios *et al.*, 2015).

Indrapriyadharshini *et al* did a cross-sectional study to assess the OHRQoL in treated oral cancer patients among the Indian population in the Kanchipuram district, India. He divided patients into three groups according to the treatment they had, namely, surgery alone, surgery and radiotherapy, as well as surgery, radiotherapy and chemotherapy in combination. They concluded that the OHRQoL deteriorates with increased treatment methods used, indicating a significant difference when comparing the surgery group to the three modalities group in the functional limitation questions. The measure used was OHIP-14 translated to Tamil language (local language), which constituted a drawback to the study because the translated version of OHIP-14 was not verified and limited comparability. Also, they recorded several significant differences between males and females (Indrapriyadharshini *et al.*, 2018).

The study has also confirmed certain findings of other studies, such as that low socio-economic status has a worse effect on QoL by increasing the chance of getting oral cancer due to poor oral hygiene, in addition to the identification of increased recording of late cancer stages due to delayed patient visits to health-care facilities (Indrapriyadharshini *et al.*, 2018).

2.7 Conclusion

In conclusion, oral squamous cell carcinoma (OSCC) is a dangerous and debilitating disease that affects patients' lives in many domains, such as major oral functions including speech, chewing and swallowing. It also affects patients' appearances in later stages and after surgical treatment and as a result, it negatively affects patients psychologically and socially. Treatment of OSCC is very aggressive because it involves radiotherapy, chemotherapy and surgeries that may cause severe facial disfigurement. In addition, it has a significant impact on QoL and OHRQoL.

3. AIM OF STUDY

The aim of the study was to investigate Oral Health-Related Quality of Life (OHRQoL) of patients who suffered from Oral Squamous Cell Carcinoma (OSCC), post-treatment.



4. OBJECTIVES

The objectives were to:

1. describe the demographic profile of the sample
2. determine the OHRQoL of OSCC patients who present for their follow-up visits
3. summarize the treatment history for OSCC including the type and duration of treatment received
4. describe the clinical aspects of the tumour including staging, location and oral symptoms at diagnosis



5. MATERIALS AND METHODS

The present study utilized one instrument which was delivered in three parts in order to collect data. The first part was a researcher-administered data collection sheet to collect oral cancer data from patients' hospital records. The second part was a researcher administered questionnaire to collect demographic data. The third part was to complete the Oral Health Impact Profile (OHIP-14) form, which is a validated instrument to determine OHRQoL.

5.1 Study Design

This was a cross-sectional study.

5.2 Study Site

The study was conducted at the Department of Radiation Oncology, Tygerberg Hospital, Cape Town, South Africa.



5.3 Population

Patients diagnosed with Oral Squamous Cell Carcinoma (OSCC) at Tygerberg Hospital (Cape Town, Western Cape) who were attending their follow-up visits from 28/04/2021 to 30/06/2021. Patients' files were available at the Department of Radiation Oncology, Tygerberg Hospital. The data from files were acquired a day before the follow-up visit to identify patients included in the study.

5.4 Sampling

Convenience sampling was performed (n = 50) after consultation with a statistician due to study limited time and low budget. The first 50 patients who met the inclusion criteria and who gave informed consent, were included in the study.

5.5 Selection Criteria

The following criteria were set in determining whether a patient may or may not be included in the study

5.5.1 Inclusion Criteria

1. Patients diagnosed with OSCC (oral cavity proper) who attended for their follow-up visits.
2. Patients aged 18 years old and above.
3. Only patients were included who had their last treatment three months or longer as the hospital first visit is scheduled after three months.

5.5.2 Exclusion Criteria

1. Patient who are diagnosed with oral pharyngeal carcinoma.
2. Patients who had their last treatment less than three months before the data collection



5.6 Instrument

The Oral Cancer History part of the data collection page (Appendix 5) was completed by the researcher one day before patients presented at the clinic for their follow-up visit at Department of Radiation Oncology, Tygerberg Hospital.

The demographic profile and The English Oral Health Impact Profile-14 (OHIP-14) questionnaire were self-administered by OSCC patients during their follow-up visits at the Department of Radiation Oncology, Tygerberg Hospital. OHIP-14 was chosen over questionnaires due to its sensitivity towards less severe impacts (Hongxing *et al.*, 2014). The demographic profile included measures such as age, sex, employment status, education and marital status (Appendix 5). About 5 - 10 patients presented at the clinic each week. The researcher was available while participants completed the questionnaire in case of any enquiry or if anything was unclear. Afrikaans and

IsiXhosa translation copies of the original questionnaire were made by two native speakers and were available to participants who requested them.

5.7 Data Collection

The data was retrieved from the completed questionnaires, categorized, coded and transferred into a spread sheet in Microsoft Excel 2010 in the computer.

5.8 Validity and Reliability

The OHIP-14 has already been validated and its reliability has been proven (Slade, 1996; Montero-Martín *et al.*, 2009). The content of the questionnaire was reviewed by senior experts at the Department of Community Oral Health and during the data collection process, filled questionnaires were checked immediately for completeness by the researcher.

The author was the only investigator involved in the data collection process. Statistical analysis and interpretation were done mainly by the author and an independent statistician.

5.9 Data Analysis

5.9.1 Description

A basic descriptive analysis was done using Microsoft Excel 2010. The database was imported into Stata/IC 16 to perform more complex statistical analyses. The independent t-test was used to determine the correlation between two categories variables. The Robust test and One-way ANOVA were employed to determine the correlation between more than two categories' variables. Chi-square tests were used for associations. The statistical level of significance was determined at 0.05. Linear regression was used to determine the cause-and-effect relationship between variables.

5.10 Establishing Contacts

Access to the participants of the study was initially by a letter to Head of the Oncology Radiation Department. An introduction of the researcher, the basic aims and objectives of the study, what participating in the study would involve and how long the questionnaire would take were explained. It was emphasized that that strict confidentiality would be maintained at all times and that the results of the study would be presented in a manner that ensured anonymity. Once signed informed consent (Appendix 3) was received from each participant, questionnaires were handed to them and collected after done with completion.

5.11 Storage and Duration of Collected Data

Collected data and results are kept under password-protected files and will be deleted permanently after three years.

5.12 Ethical Considerations

The research proposal was approved by the Biomedical Research Ethics Committee of the University of the Western Cape (Appendix 6). Further research approval was also obtained from the Western Cape Department of Health. Participation was voluntary and anonymous and signed informed consent was obtained from each patient. Anonymity was secured by not using the participants' names on the questionnaires and were recorded with reference codes. The questionnaire completion process took place in a private room at the Department of Radiation Oncology.

5.12.1 Collaborative Partnership

To obtain access to the selected participants a good relationship was established between the investigator and the responsible staff at the Department of Radiation Oncology. These included nurses, oncology registrars and oncologists at the Radiation Oncology Department. Meetings with them before the participant selection ensured a level of trust and consideration. During these meetings, the study was explained in detail regarding the objectives, aims and methods. An

opportunity was created for questions to be asked and to ensure a proper understanding of the study.

5.12.2 Social Value

Beneficiaries of the research were the participants who received a free dental consultation by a qualified dentist that included essential oral health education and instructions.

5.12.3 Informed Consent

Signed informed consent had been obtained from all participants after they were fully informed of the aim, objectives and methodology of the study. Participants were able to ask questions and were informed that they could withdraw from the study at any stage.

5.12.4 Respect for Recruiting Participants and Study Communities

Participants were aware that they could withdraw from the study at any point in time without any form of prejudice regarding future management. The university and the community would be informed of the study findings.

5.13 Risks of Study

No risk associated with the study.

5.14 Cost of Study

All costs incurred with the study were the sole responsibility of the investigator.

| Budget category | Unit cost (ZAR) | Number of units | Total cost (ZAR) |
|------------------------------|------------------------|------------------------|-------------------------|
| Travel and living expenses | 20 000 | | 20 000 |
| Translation of questionnaire | 1/word | 360 | 360 |
| Proofreading expenses | 30/page | 18 | 540 |
| Unexpected expenses | | | 1 000 |
| Total | | | 21 900 |

Table 3: Study Budget

5.15 Declaration of Interest

The researcher had no association or commercial interest that represented a conflict of interest in connection with this study.



6. RESULTS

This chapter reports on the findings of the researcher- and self-reported data that was collected on demographic factors, history of oral cancer and completed Oral Health Impact Profile (OHIP-14) forms.

6.1 Response Rate

A total of 50 participants were included in this study. All of them were patients visiting the Department of Radiation Oncology, Tygerberg Hospital in The City of Cape Town for their follow-up visits. 6 of them filled the questionnaires in Afrikaans language, 1 in IsiXhosa and 43 in English.

6.2 Demographic Information

Table 4 shows descriptive statistics of all the participants included in the study.

6.2.1 Age Distribution

The mean age of the sample was 58.56 (SD = 10.55) years. The median for age was also 59 indicating that age was negatively skewed. The inter-quartile range for age was 53 – 67. Half were aged between 52 – 66 years old. The mean age of male participants was 57.7 years, while for female participants it was 59.8 years. The youngest participant in the study was 18-years old and the oldest 82-years old. The participants were categorized into three age groups: < 55 years, 55 – 64 years and ≥ 65 . Just more than a third (36%) belonged to the middle category and the rest (64%) were equally distributed between the first and the latter categories.

6.2.2 Sex

The majority of the sample were males (60%).



6.2.3 Employment Status

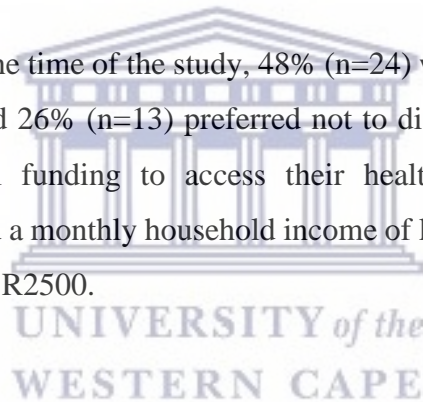
Just less than half (46%) were pensioners and only 3 participants were full-time employed. One participant was a student.

6.2.4 Level of Education

Almost two thirds (60%) of the sample had high school or higher levels of education and the rest had only received primary education or no schooling at all.

6.2.5 Other Demographics

In Table 4, we observed that at the time of the study, 48% (n=24) were married, 26% (n=13) were single, divorced or widowed and 26% (n=13) preferred not to disclose this information. All the participants used governmental funding to access their health services. Income was also investigated and 60% (n=30) had a monthly household income of less than R2500 and the rest had an income equal to or more than R2500.



6.3 Oral Cancer History

Table 5 displays oral cancer history information obtained from participants' files and records as described in the methods section.

6.3.1 Main Complaint

The main complaint was reported by using the patients' own words in describing their symptoms when they first visited the hospital or the health-care facility. Half of the participants mentioned painless lesions as their main complaint in their first visit, while 22% (n=11) described having painful lesions, and 14% (n=7) described having a swelling or a mass. Finally, ulcer, sore throat or loose teeth were described by few participants.

6.3.2 Cancer Location

The tongue was the most common reported site for OSCC in our study population, representing 30% (n=15) of the cancer locations. Followed by the floor of the mouth (FOM) which accounts for 28% (n=14), other sites in the oral cavity like buccal mucosa, soft palate, mandible, lips or combination of all had been reported to a lesser extent.

6.3.3 Tumour Grade

The majority of the sample (78%, n=39) had Well-differentiated tumour grade and the rest had Moderate-differentiated tumour grade.

6.3.4 Cancer Staging

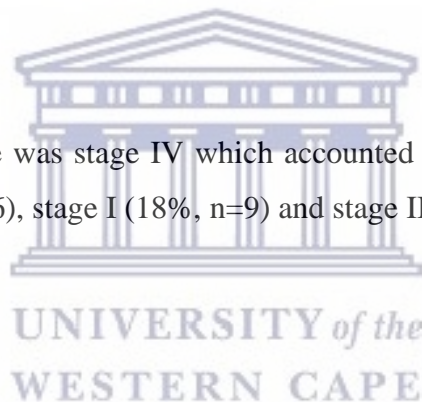
The most prevalent cancer stage was stage IV which accounted for 40% (n=20) of the sample, followed by stage III (32%, n=16), stage I (18%, n=9) and stage II (10%, n=5).

6.3.5 Treatment

The participants had different treatment modalities with some only receiving radiation and others, receiving surgery solely. However, the majority (56%, n=28) received a combination therapy of radiation + surgery. The other combination therapy included; radiation + chemotherapy, and radiation + surgery + chemotherapy.

6.3.6 Follow-up

Participants in their 3rd and 9th month follow-up visits accounted for a total of 40% (n=20) of the study population (20%, n=10 each). The 18th month of follow-up showed the least participant number (6%, n=3).



6.4 Descriptive Statistics of OHIP-14 Score

The One-way ANOVA test was conducted to determine if the OHIP-14 score was different among different categories for each variable. The Bonferroni correction was also performed as a post hoc test. The total OHIP-14 mean score (MS) was 22.92 with a standard deviation (SD) of 17.62.

Table 4 shows descriptive statistics of the OHIP-14 score in regard to all demographic variables of the study population used in the analysis. Descriptive statistics used were the mean and standard deviation, with a statistical significance (SS) established at $p < 0.05$.

OHIP-14 mean scores (SD) of the first and the last age group were 25.06 (17.38) and 26.25 (19.22) respectively, which showed some similarity in the two groups with no SS difference in means ($p = 0.34$). OHIP-14 mean scores of Sex categories showed no SS difference ($p = 0.29$). Married participants showed the highest mean score (SD) among the other categories in their group 25.04 (17.01) and no SS difference was reported ($p = 0.45$). Education, Employment Status and Income also showed no SS difference and had a ranging mean score of 21 (0) – 28.67 (12.06) among the groups in the different three variables.

| Variables | Categories | n (%) | Mean OHIP-14 score (SD) per category | p-value |
|----------------------|-----------------------------|---------|--------------------------------------|---------|
| Age | < 55 | 16 (32) | 25.06 (17.38) | 0.34 |
| | 55-64 | 18 (36) | 18.06 (16.20) | |
| | >= 65 | 16 (32) | 26.25 (19.22) | |
| Sex | Female | 20 (40) | 19.65 (16.72) | 0.29 |
| | Male | 30 (60) | 25.1 (18.33) | |
| Marital Status | Single, divorced or widowed | 13 (26) | 17.54 (19.50) | 0.45 |
| | Married | 24 (48) | 25.04 (17.01) | |
| | Non disclosed | 13 (26) | 24.38 (17.04) | |
| Education | High School or Higher | 30 (60) | 21.77 (17.42) | 0.58 |
| | Primary School or Less | 20 (60) | 24.65 (18.22) | |
| Employment Status | Full-time | 3 (6) | 28.67 (12.06) | 0.77 |
| | Retired | 23 (46) | 24.96 (18.36) | |
| | Student | 2 (4) | 21.00 (0) | |
| | Unemployed | 23 (46) | 20.28 (18.02) | |
| Income | < R2500 | 30 (60) | 22.63 (17.16) | 0.89 |
| | >= R2500 | 20 (40) | 23.35 (18.73) | |
| Total OHIP Mean (SD) | | | 22.92 (17.62) | |

Table 4: Demographic Profile and OHIP_14 Score

Table 5 shows descriptive statistics of OHIP-14 score of the Oral Cancer History variables of the study population used in the analysis.

| Variables | Categories | n (%) | Mean OHIP score (SD) Per Category | p value |
|-----------------------------|------------------------------------|---------|--------------------------------------|---------|
| Main Complain | Loose teeth and pain | 1 (2) | 41.00 (0) | 0.17 |
| | Mass or Swelling | 7 (14) | 19.00 (14.74) | |
| | Painful Lesion | 11 (22) | 14.27 (11.46) | |
| | Painless Lesion | 28 (56) | 28.4 (17.58) | |
| | Sore Throat | 1 (2) | 4.00 (0) | |
| | Ulcer | 5 (10) | 20.20 (26.33) | |
| Location | Buccal mucosa | 5 (10) | 16.2 (15.82) | 0.64 |
| | Buccal mucosa and Lower jaw | 1 (2) | 21.00 (0) | |
| | FOM | 14 (28) | 26.79 (16.56) | |
| | Lip | 5 (10) | 30.2 (16.56) | |
| | Lower jaw | 3 (6) | 25.67 (20.03) | |
| | Soft palate | 6 (12) | 12.33 (19.65) | |
| | Tongue | 15 (30) | 21.87 (14.61) | |
| | Tongue and FOM | 1 (2) | 39.00 (0) | |
| Tumour Grade | Well-Differentiated | 39 (78) | 23.54 (17.53) | 0.65 |
| | Moderate-Differentiated | 11 (22) | 20.72 (18.62) | |
| Cancer Staging | I | 9 (18) | 9.78 (11.50) | 0.02* |
| | II | 5 (10) | 12.4 (13.96) | |
| | III | 16 (32) | 23.69 (16.21) | |
| | IV (A) | 15 (30) | 33.27 (17.12) | |
| | IV (B) | 4 (8) | 19.25 (20.19) | |
| | IV (C) | 1 (2) | 41.00 (0) | |
| Treatment | Radiation alone | 3 (6) | 27.00 (23.39) | 0.09 |
| | Surgery alone | 6 (12) | 15.17 (21.76) | |
| | Radiation + Surgery | 28 (56) | 19.07 (14.70) | |
| | Radiation + Chemotherapy | 1 (2) | 25.00 (0) | |
| | Radiation + Surgery + Chemotherapy | 12 (24) | 34.58 (17.71) | |
| Follow-up Visit | 3 Months | 10 (20) | 27 (19.97) | 0.27 |
| | 6 Months | 8 (16) | 21 (17.54) | |
| | 9 Months | 10 (20) | 20.6 (13.19) | |
| | 12 Months | 4 (8) | 26.75 (17.91) | |
| | 18 Months | 3 (6) | 43.33 (13.01) | |
| | 24 Months | 6 (12) | 11.33 (14.67) | |
| | >24 Months | 9 (18) | 21.89 (19.85) | |
| Total OHIP Mean (SD) | | | 22.92 (17.62) | |

Table 5: Oral Cancer History and OHIP-14 Score.

As the majority of the study population had painless lesions as their main complaint, it also scored the highest OHIP-14 mean score (SD) 28.4 (17.58) among the other categories in the group.

Loose teeth and sore throat were two of the least reported complaints and they showed the least OHIP-14 mean score, 41(0) and 4(0), respectively. There was no SS mean difference in OHIP-14 score among all the categories in this group ($p = 0.17$).

OHIP-14 mean scores of cancer location followed almost a similar pattern to locations' frequencies. Tumour grades OHIP-14 mean scores (SD) were 23.54 (17.53) and 20.72 (18.62) for well-differentiated and moderately-differentiated, respectively. There was no SS difference in means between the two categories ($p = 0.65$).

Forty percent had cancer stage IV divided into (A = 30%, B = 8% and C = 2%). The highest mean (SD) of OHIP-14 Score among these categories was stage IV(C) which was equal to 41.00 (0) and the least score (9.78(11.50)) belonged to stage I. A p -value of 0.02 was calculated which indicated SS between the variable categories. Table 6 shows Bonferroni's correction which narrows the difference to be between stage I and stage IV(A).

| Comparison of OHIP-Score by cancer stage (Bonferroni) | | | | | |
|---|------------------|------------------|------------------|-------------------|----------------|
| Row Mean Column Mean | i | ii | iii | iv (A) | iv (B) |
| ii | 2.62222 1.000 | | | | |
| iii | 13.9097 0.621 | 11.2875 1.000 | | | |
| iv (A) | 23.4889 0.016 | 20.8667 0.219 | 9.57917 1.000 | | |
| iv (B) | 9.47222 1.000 | 6.85 1.000 | -4.4375 1.000 | -14.0167 1.000 | |
| iv (C) | 31.2222 1.000 | 28.6 1.000 | 17.3125 1.000 | 7.73333 1.000 | 21.75 1.000 |

Table 6: Bonferroni correction for the difference in OHIP-14 mean score between cancer stage categories

Regarding treatment received, the highest OHIP-14 score Mean was scored by participants who had surgery + radiation + chemotherapy combined (34.58 (17.71)). a p -value of 0.09 was calculated indicating no OHIP-14 score means' SS difference.

The highest OHIP-14 mean score (SD) (43.33 (13.01)) belonged to participants who attended their 18th month follow-up visit. Again, no SS difference ($p = 0.27$) between the means of OHIP-14 score of the categories in this group was found.

6.5 OHIP-14 Score Multiple Linear Regression Findings

Table 7 shows multiple linear regression that was run using a p -value = 0.01 as a cut-off for significance. None of the variables were significant at $p < 0.01$ with forward or backward selection and all the confidence intervals included the null value of 0.00 which also implies non-significance.

Regarding age, we observed that participants belonging to the age group (55-64 years) had a 3.36 decreased OHIP-14 score, and the age group (≥ 65 years) had an increased score by 1.35, all in comparison with (< 55 years) group when considering all other demographic factors, main complaint, tumour grade, cancer stage, treatment, and follow-up visit.

According to this model, males had a lower OHIP-14 score by 8.83 compared to the female participants when considering all other factors.

Having received no schooling or primary schooling showed 3.56 less OHIP-14 score in comparison with participants having high school education or higher education, adjusting for other factors. Participants who had \geq R2500 had a 11.17 higher OHIP-14 score than those having $<$ R2500, considering other factors. Retired participants, students and unemployed participants had higher 9.89, 24.43 and 14.03 (respectively) OHIP-14 scores compared to the full-time employed participants, considering the other factors of the study.

Having loose teeth and pain as a reference group in the main complaint variable, all other categories showed a decreased OHIP-14 score in comparison. Well-differentiated tumour grade had an increased OHIP-14 score by 5.64 in comparison to the Moderate-differentiated grade, holding into account all other study factors. Compared to participants who were diagnosed with cancer stage I, all other participants diagnosed with different cancer stages had a higher OHIP-14

score, adjusting for all other study factors. Concerning treatment modality, radiation alone, surgery alone, radiation + surgery, and radiation + surgery + chemotherapy, all had lower OHIP-14 scores compared to participants who received radiation + chemotherapy, adjusting to the other study factors. Participants who were in the 18th month follow-up visit had 16.78 higher OHIP-14 scores compared to those who were in their +24th month follow-up visit, while those who were having their 6th month follow-up visit had a 9.25 lower OHIP-14 score compared to those who were in their +24th follow-up visit, considering all the study factors.



| OHIP-14 Score | Coefficient | P> t | [95% conf. interval] | |
|------------------------------------|-------------|-------|----------------------|----------|
| Age | | | | |
| < 55 years | 0 | | | |
| 55-64 years | -3.360456 | 0.789 | -29.24586 | 22.52495 |
| >=65 years | 1.347738 | 0.938 | -34.33656 | 37.03204 |
| Gender | | | | |
| Female | 0 | | | |
| Male | -8.831311 | 0.444 | -32.4885 | 14.82588 |
| Marital Status | | | | |
| Divorced, Widowed or Single | 0 | | | |
| Married | 13.92184 | 0.318 | -14.48434 | 42.32802 |
| Non-disclosed | 17.90814 | 0.129 | -5.697749 | 41.51403 |
| Education | | | | |
| High school or higher | 0 | | | |
| Primary school or less | -3.563544 | 0.626 | -18.60772 | 11.48063 |
| Employment Status | | | | |
| Full-time | 0 | | | |
| Retired | 9.892582 | 0.723 | -47.67033 | 67.45549 |
| Student | 24.42592 | 0.369 | -31.18453 | 80.03636 |
| Unemployed | 14.21558 | 0.475 | -26.61095 | 55.04211 |
| Income | | | | |
| <R2500 | 0 | | | |
| >=R2500 | 11.17182 | 0.266 | -9.23949 | 31.58313 |
| Main Complain | | | | |
| Loose teeth and pain | 0 | | | |
| Mass or Swelling | -63.40304 | 0.254 | -176.2587 | 49.4526 |
| Painful Lesion | -68.51794 | 0.13 | -159.1868 | 22.15097 |
| Painless Lesion | -55.26746 | 0.217 | -145.8473 | 35.3124 |
| Sore Throat | -79.04077 | 0.329 | -244.2494 | 86.16782 |
| Ulcer | -61.94248 | 0.244 | -169.8781 | 45.99314 |
| Tumour Grade | | | | |
| Moderate-Differentiated | 0 | | | |
| Well-Differentiated | 5.636966 | 0.569 | -14.69729 | 25.97122 |
| Cancer Staging | | | | |
| I | 0 | | | |
| II | 21.89882 | 0.145 | -8.270719 | 52.06835 |
| III | 20.07255 | 0.058 | -0.7147963 | 40.8599 |
| IV (A) | 30.54875 | 0.013 | 7.327697 | 53.76981 |
| IV (B) | 43.11968 | 0.264 | -35.22514 | 121.4645 |
| Treatment | | | | |
| Chemotherapy + Radiation | 0 | | | |
| Radiation alone | -41.56353 | 0.38 | -138.2478 | 55.12078 |
| Surgery alone | -7.155406 | 0.785 | -61.24429 | 46.93348 |
| Radiation + Surgery | -16.34206 | 0.514 | -67.73393 | 35.0498 |
| Radiation + Surgery + Chemotherapy | -5.136538 | 0.832 | -55.02454 | 44.75146 |
| Follow-up Visit | | | | |
| +24 months | 0 | | | |
| 3 months | 11.9038 | 0.553 | -29.39343 | 53.20102 |
| 6 months | -9.247618 | 0.527 | -39.29949 | 20.80425 |
| 9 months | -0.6115601 | 0.956 | -23.25554 | 22.03242 |
| 12 months | 13.22238 | 0.361 | -16.3438 | 42.78855 |
| 18 months | 16.77645 | 0.29 | -15.49102 | 49.04392 |
| 24 months | -5.028843 | 0.727 | -34.68663 | 24.62894 |
| _cons | 48.26916 | 0.443 | -80.79197 | 177.3303 |

Table 7: Multiple Linear Regression Report

6.6 Descriptive Statistics of OHIP-14 Dimensions

Every two questions in the OHIP-14 questionnaire corresponded to one dimension, hence, it had 7 dimensions. The score of each dimension is the sum of the values of the two questions that formed it. Each question could have a value ranging from 0-4, since the study sample size was 50, therefore, each dimension could attain a possible maximum value of 400 points.

Functional limitations dimension corresponds to question 1 and 2, Physical pain dimension corresponds to question 3 and 4, Physical disability dimension corresponds to question 5 and 6, Psychological discomfort dimension corresponds to question 7 and 8, Psychological disability dimension corresponds to question 9 and 10, Social disability dimension corresponds to question 11 and 12, while question 13 and 14 corresponds to Handicap dimension (Table 8).

| | |
|--|---|
| 1- Within the last week, have you had trouble pronouncing words because of problems with your teeth or mouth? | 8- Within the last week, has your diet (food and drinks that you had) been unsatisfactory because of problems with your teeth or mouth? |
| 2- Within the last week, have you felt that your sense of taste has worsened because of problems with your teeth or mouth? | 9- Within the last week, have you found it difficult to relax because of problems with your teeth or mouth? |
| 3- Within the last week, have you had painful aching in your mouth because of problems with your teeth or mouth? | 10- Within the last week, have you been a bit embarrassed because of problems with your teeth or mouth? |
| 4- Within the last week, have you found it uncomfortable to eat any foods because of problems with your teeth or mouth? | 11- Within the last week, have you been a bit irritable with other people because of problems with your teeth or mouth? |
| 5- Within the last week, have you been self-conscious (aware of problems with your teeth)? | 12- Within the last week, have you had difficulty doing your usual jobs? |
| 6- Within the last week, have you felt tense (stressed) because of problems with your teeth or mouth? | 13- Within the last week, have you felt that life in general was less satisfying? |
| 7- Within the last week, have you had to interrupt meals because of problems with your teeth or mouth? | 14- Within the last week, have you been totally unable to function? |

Table 8: OHIP-14 Questions

Physical pain obtained the highest dimensional score (210/400) among the others; therefore, this dimension was the main contributor to the deteriorating OHRQoL in our study population. The

second highest score was functional limitation dimension (202/400), followed by physical disability (186/400), psychological discomfort (157/400), psychological disability (136/400), and social disability (129/400). The lowest score attained was the handicap dimension (126/400) as shown in Figure 1.

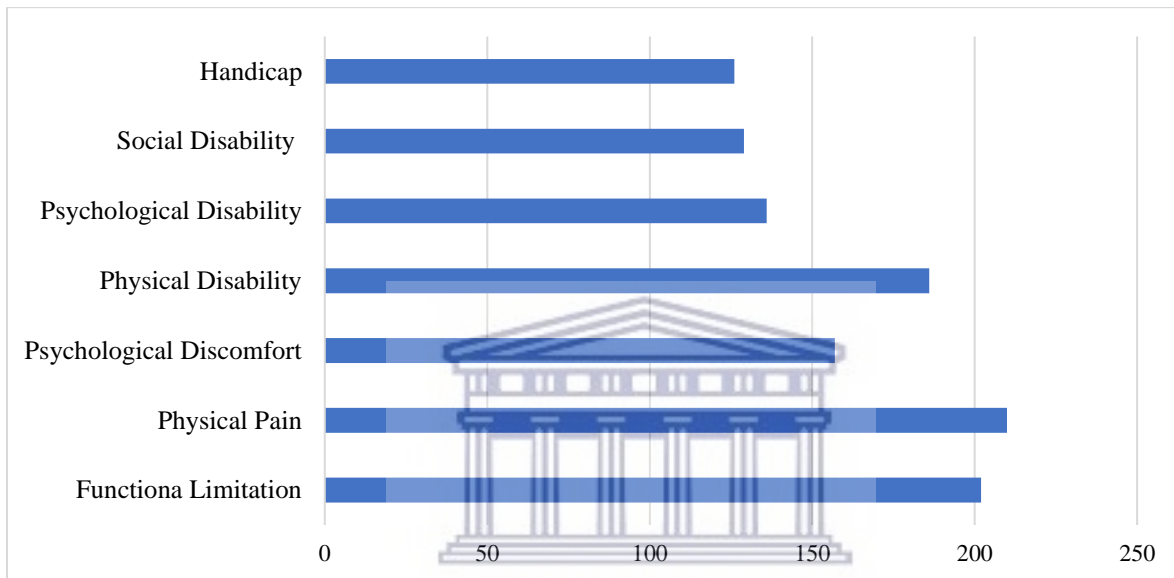


Figure 1: Distribution of Dimension Scores Achieved by Size.

Figures 2 and 3 describe the *p*-values of the difference between the different categories among the variables in relation to the OHIP-14 dimensions (Functional Limitation, Physical Pain, Psychological Discomfort, Physical Disability, Psychological Disability, Social Disability and Handicap). *P*-value of less than 0.05 was SS.

As showed in Figure 2, there was a SS in means difference between cancer staging categories in regards to physical pain and handicap, add to that the SS difference between treatment means in regards to the physical pain dimension.

Figure 3 illustrates that the *p*-value of main compliant in the psychological disability dimension score equalled 0.051 indicating SS. Cancer staging categories also had a SS difference in regards

to the means score of psychological discomfort and social disability dimensions ($p = 0.005$, $p = 0.04$) respectively. The mean difference between treatment types categories in regards to psychological discomfort also found SS with a p -value of 0.02.

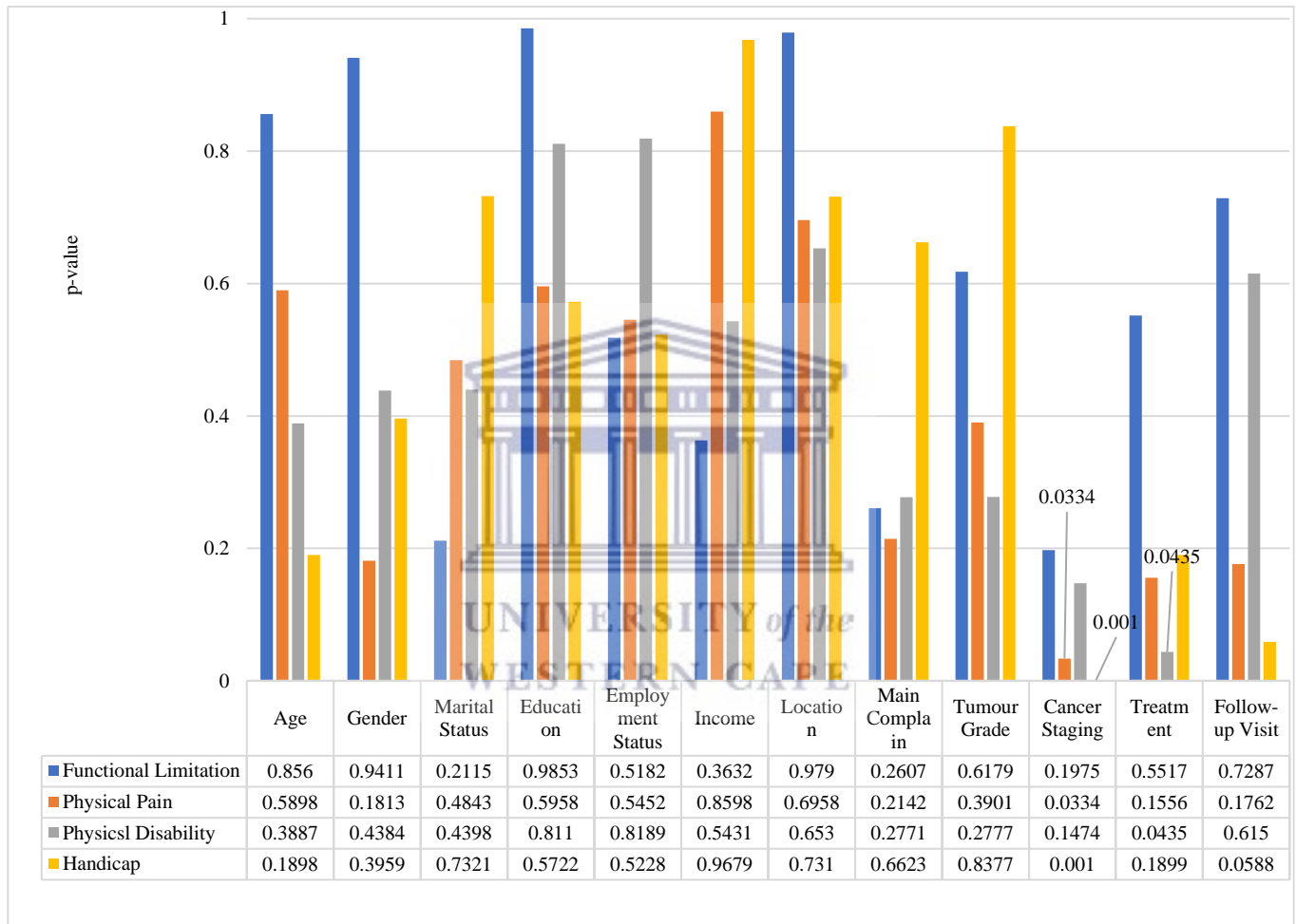


Figure 2: P-values of OHIP-14 dimensions' (Functional Limitation, Physical Pain, Physical Disability and Handicap) means difference between variables of different categories.

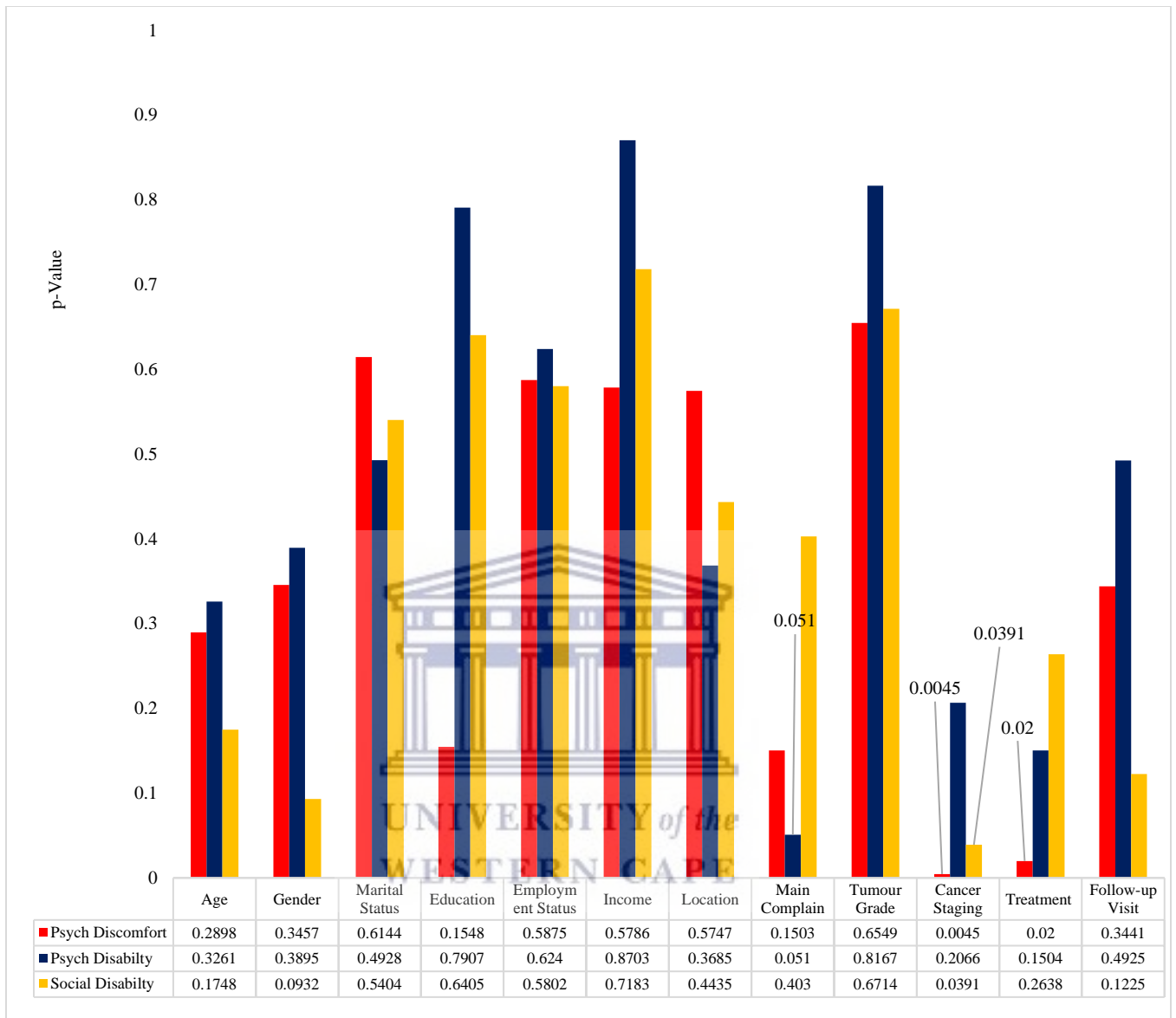


Figure 3: P-values of OHIP-14 Dimensions' (Psychological Discomfort, Psychological Disability and Social Disability) Means Difference between variables of different categories.

7. DISCUSSION

The construct QoL is a global construct comprised of many overlapping dimensions or “domains” of life. In the medical research field this new construct has been developed extensively, mainly to assess individuals’ perceptions of overall-wellbeing. To our knowledge few studies evaluating QoL posttreatment for oral cancer patients are available in the literature.

Oral cancer treatment is a very difficult process that causes many different obstacles for patients and ends up worsening their QoL. The interpretation of these issues could enable physicians to have better clinical judgment in the future and enhance their selection of treatment approaches. OHRQoL is a construct designed specifically to encompass the complexity of the oral cavity. Measuring OHRQoL could be done through different ways, one of them is through the use of questionnaires such as the University of Washington QoL scale, the Functional assessment of cancer therapy-Head and Neck scale, the European Organization for Research and Treatment of cancer QoL core questionnaire 30, Oral Impact of daily performances and Oral Health Impact Profile (OHIP). Among the various above-mentioned questionnaires, OHIP-14 is most commonly used in oral cancer patients due to its superior demonstration of the changes in their QoL. The OHIP originally started as 49 questions, then a shorter version (OHIP-14) was developed due to the impracticality of the original version in the clinical setting in many respects, such the irrelevancy of some questions to specific oral health status. The shorter version has been proven to be reliable, valid and sensitive to changes with an adequate cross-cultural consistency (Indrapriyadharshini *et al.*, 2018).

Although the impact found in OHRQoL is moderate in some studies, this area of research deserves more attention as individuals experiencing oral cancer tend to be emotionally fragile. As a confirmation of this matter a study in the USA reported that among HNC patients, the incidence of suicide is over three times higher than in the general population (Stuani *et al.*, 2018).

Many researchers’ findings suggest that QoL returns to baseline after HNC treatment, but So *et al* suggest that some treatment-related morbidity dimensions do not recover in the 12-month period

after treatment. This indicates the need to prepare patients for the possibility of adverse symptoms and treatment side effects to persist 12 months after treatment (So *et al.*, 2012).

In this study we assessed the OHRQoL of OSCC patients that received different treatment modalities during different follow-up visits. The mean age of our study population was 58.56 which coincides with the fact that most of the cancer patients were from the geriatric population (Botha, Schoonees & Pontes, 2018) in the 6th decade to be precise (Abram, 2013) and the majority of the participants were males with a 1.5:1 male to female ratio, which is exactly the same reported ratio of oral cancer globally (Abram, 2013; Botha *et al.*, 2018). However, Karbach *et al* reported that there is no influence between age and sex on OSCC (Karbach *et al.*, 2014).

Earlier studies reported the importance of socioeconomic status as a risk factor for oral cancer (Abram, 2013), besides it being a major predictor of disease morbidity and mortality among this patient group. Hence, it is considered a very important factor affecting OHRQoL. In this study the rate of unemployment was 46% of our study population, while 60% reported a monthly household income of less than R2500 which collectively indicated the lower socioeconomic status of the majority of participants. This is in accordance with the studies by Indrapriyadharshini *et al* (2018) and Khandekar *et al* (2006) who reported that low socioeconomic status might be a risk factor for poor oral hygiene, which in turn increases the risk of oral cancer (Indrapriyadharshini *et al.*, 2018). Additionally, individuals with little education and low income are more likely to drink alcohol, smoke cigarettes and chew tobacco which are all risk factors for oral cancer. Low socioeconomic status and low income in developing countries are also associated with many difficulties in accessing health-care facilities and hence, contribute to late diagnosis of oral cancer. Therefore, their treatment might be extremely more aggressive and have a poor prognosis. Regarding oral cancer and level of education, these two are inversely proportional to each other (Indrapriyadharshini *et al.*, 2018). 60% of our study population attended high school or further education which does not line up with this reported relationship.

OSCC is presented in many forms inside the oral cavity and the presentation differs according to cancer stage, location and the type of tissue affected. In our study population the most common complaint was painless lesions (n = 56%) and painful lesions (n = 22%). Although most of the

participants did not know how to articulate what they experienced, some participants were able to describe specifically what they were experiencing (ulcer, mass or swelling).

Location of cancer in the oral cavity is influenced by many factors such as the individual's personal habits and irritating factors. In a study conducted in India by Indrapriyadharshini, *et al.*, the most common reported site was buccal mucosa, as it is influenced by the habit of using different forms of tobacco in that region (Indrapriyadharshini *et al.*, 2018). The significance between the variation in oral cancer location and the habit of tobacco consumption has already been proven (Singhania *et al.*, 2015). However, this is applicable in India and does not match our population which is based in South Africa. In the present study, the most common site recorded was the tongue (n=30%) and FOM (n=28%) which coincide with the most common site of oral cancer reported in the literature, justified by the accumulation of carcinogens in the FOM area (Scully, 2013). Similarly, Khandelwal *et al.* reported the retromolar region, tongue and FOM as the most common site of oral cancer respectively (Khandelwal *et al.*, 2017).

In our study population no participant had a poorly-differentiated tumour grade. However, the majority had well-differentiated tumour grades (n=78%) which has a better prognosis than the former.

In developing countries, the problem of delayed reporting of oral cancer to health-care facilities is one of the main causes of patients being diagnosed at late stages (Khandekar *et al.*, 2006). In spite of the accessibility of the oral cavity for clinical examination, most patients tend to delay their visit due to lack of awareness or ignorance (Khandelwal *et al.*, 2017). Our findings supports this finding as 40% of our participants were in stage IV and 32% were in stage III, both of them are late oral cancer stages which agrees with the fact that approximately 80% of HNC "oral cancer included" patients in developing countries present in stage III and IV (Khandelwal *et al.*, 2017). Indrapriyadharshini *et al* reported similar results in their study supported by the same reasons (Indrapriyadharshini *et al.*, 2018).

In our current study, 56% of the participants had surgery and radiation as treatment of choice and 24% had surgery + radiation + chemotherapy combined, collectively accounting for 80% of our

study population. This finding goes along with Stuani *et al* who had 90% of their study population divided between the two treatment combinations. However, our study population only included participants diagnosed with OSCC while the Stuani *et al* study population included all types of HNC. One explanation for participants being concentrated in these two treatment combinations is that most of our participants were in the late oral cancer stages requiring aggressive and extensive therapy (Stuani *et al.*, 2018).

Regarding participants' perceived OHRQoL, all the demographic variables showed no statistically significant difference among their categories, despite the study done by Khandelwal *et al* who found a minor impact on QoL caused by age (Khandelwal *et al.*, 2017). One explanation for the absence of this finding in our study is that our study population was mostly centred among geriatrics.

In our study the highest OHIP-14 score mean in regards to location of cancer belonged to a participant who had OSCC in both tongue and FOM which indicates the serious negative effects of the impairment of these structures on function, speech and eating and therefore on OHRQoL although there was no consensus in the literature about whether the QoL is affected by the location of cancer in the oral cavity (Barrios *et al.*, 2015).

As predicted, the worst OHRQoL was reported in participants diagnosed with oral cancer stage IV. This is related to the combined treatment provided to them and the large extent of damage caused by the cancer itself before treatment.

Regarding treatment modalities' impact on OHRQoL, our finding corresponds with the literature in that the OHRQoL of participants who received surgery alone were better than those who received any combined treatment in terms of OHIP-14 score. This is explained by the fact that surgery causes a little damage to the oral structure and function, and less complications after treatment (Barrios *et al.*, 2015; Indrapriyadharshini *et al.*, 2018). Nevertheless, participants who received all three treatment modalities (surgery + radiation + chemotherapy) had the worst OHRQoL. This is mostly attributed to side-effects of each modality and the possible complications

of radiation such as pain, mucositis, mucosal and bony necrosis, and altered taste (Barrios *et al.*, 2015).

Concerning follow-up visit, in this study population, participants in their 18th month visit recorded the worst OHRQoL among follow-up categories, contradicting with Khandelwal *et al* who stated that long-term survivors had good QoL (Khandelwal *et al.*, 2017). Barrios *et al.* reported inconclusively about a specific follow-up period to be associated with improved OHRQoL (Barrios *et al.*, 2015).

Our study also observed that an experience with oral cancer leads to a negative impact on patients' OHRQoL in terms of physical pain, functional limitation and physical disability dimensions as well as their total score. This aligns with Barrios *et al.*, despite the absence of statistical significance in our study. This finding also agrees with what has been proven before, among HNC patients (Stuani *et al.*, 2018).

Our study results have to be interpreted with the following limitations. The study design was cross-sectional, which prevented us from making any causal inferences. Participants' selection was limited to one institution, and the small sample size might have introduced some selection biases. Due to comparability limitations in this study, studies with a bigger context are recommended to increase generalizability. After all, the present study only provided baseline information on the OHRQoL of OSCC patients in a developing country.

Another limitation was the use of OHRQoL questionnaires, although they are beneficial when it comes to comparing findings between different populations, they do not rule out the possibility of the impact being caused by other oral conditions. This limitation can be addressed by using an oral cancer-specific QoL measure.

Heterogeneity of treatment modalities and follow-up periods were also limitations in our study because each modality and follow-up period introduce different causal mechanism relating to the same outcome. Moreover, multiple outcomes of interest can occur in one individual.

Last two limitations of this study are: Selection bias and translation bias; the former due to the inconvenience sampling technique of the study while the latter because of translation of the questionnaire.



8. CONCLUSION

The results of this study showed that patients with OSCC in Tygerberg Hospital are usually diagnosed at late stages which raises the need for oral cancer screening programs, patients' awareness promotion programs and facilitation of accessibility to healthcare facilities to ensure that patients are diagnosed in the early stages. We also concluded from this study population that the most prevalent OSCC patient group in Tygerberg Hospital was geriatric males.

It was further found that OSCC patients who were in the late stages had poor OHRQoL. Also, patients who received all three treatment modalities (Surgery + Radiation + Chemotherapy) had poorer OHRQoL compared to patients who went through only one or two treatment modalities. The lowest OHIP-14 dimensions' scores were attributed to physical pain, functional limitation and physical pain, highlighting the need to increase the focus on physical and functional aspects of treatments and the rehabilitation process.

Our study has provided a better understanding regarding the demographic profile and oral cancer history of OSCC patients in Tygerberg Hospital in addition to providing baseline information on OHRQoL for this particular patient group.

9. REFERENCES

- Abram, M. H. (2013). The Incidence of Oral and Oropharyngeal Cancer in South Africa for the five-year period 1997-2001 (Doctoral dissertation, University of Pretoria).
- Agrawal, S. K., Dahal, S., Shrestha, A., & Bhagat, T. K. (2017). Assessment of oral health impact profile (OHIP- 14) among villagers of Jyamirgadi VDC, Nepal: a cross-sectional study. *European Journal of Biomedical and Pharmaceutical Sciences*, 4(8), 400-3.
- Ahmedin, J. D., Freddie, B., & Melissa, M. (2011). Global carcinoma statistics. *A Carcinoma Journal for Clinicians*, 61(2), 69-90.
- Al Shamrany, M. (2006). Oral health-related quality of life: a broader perspective. *EMHJ-Eastern Mediterranean Health Journal*, 12 (6), 894-901, 2006.
- Barkokebas, A., Silva, I. H. M., de Andrade, S. C., Carvalho, A. A. T., Gueiros, L. A. M., Paiva, S. M., & Leao, J. C. (2015). Impact of oral mucositis on oral-health-related quality of life of patients diagnosed with cancer. *Journal of Oral Pathology & Medicine*, 44(9), 746-751.
- Bennadi, D., & Reddy, C. V. K. (2013). Oral health related quality of life. *Journal of International Society of Preventive & Community Dentistry*, 3(1), 1.
- Barrios, R., Bravo, M., Gil-Montoya, J. A., Martínez-Lara, I., García-Medina, B., & Tsakos, G. (2015). Oral and general health-related quality of life in patients treated for oral cancer compared to control group. *Health and Quality of Life Outcomes*, 13(1), 1-8.
- Bhalla, A., Anup, N., Bhalla, A. P., Singh, S. B., Gupta, P., & Bhalla, S. (2015). Oral health related quality of life (OHRQoL) amongst head and neck cancer patients undergoing chemotherapy and radiotherapy at Sawai Mansingh hospital Jaipur, India. *Scholars Academic Journal of Biosciences*, 3, 3-12.

Botha, P. J., Schoonees, A., & Pontes, C. C. (2018). Mapping oral cancer research in South Africa. *South African Dental Journal*, 73(6), 384-394.

Cawson, R. A., & Odell, E. W. (2017). *Cawson's essentials of oral pathology and oral medicine e-book*. Elsevier Health Sciences.

Hassel, A. J., Danner, D., Freier, K., Hofele, C., Becker-Bikowski, K., & Engel, M. (2012). Oral health-related quality of life and depression/anxiety in long-term recurrence-free patients after treatment for advanced oral squamous cell cancer. *Journal of Cranio-Maxillofacial Surgery*, 40(4), e99-e102.

Hongxing, L., List, T., Nilsson, I. M., Johansson, A., & Astrøm, A. N. (2014). Validity and reliability of OIDP and OHIP-14: a survey of Chinese high school students. *BMC Oral Health*, 14(1), 1-10.

Hille, J., & Johnson, N. W. (2017). The burden of oral cancer in sub-Saharan Africa: An estimate as presented to the Global Oral Cancer Forum, March 2016. *Translational Research in Oral Oncology*, 2, 2057178X17721094.

Indrapriyadarshini, K., Madankumar, P. D., & Karthikeyan, G. R. (2017). Oral health-related quality of life in patients treated for oral malignancy at Kanchipuram district, India: A cross-sectional study. *Indian Journal of Cancer*, 54(1), 11.

Karbach, J., Al-Nawas, B., Moergel, M., & Daubländer, M. (2014). Oral health-related quality of life of patients with oral lichen planus, oral leukoplakia, or oral squamous cell carcinoma. *Journal of Oral and Maxillofacial Surgery*, 72(8), 1517-1522.

Khalifa, N., Allen, P. F., Abu-bakr, N. H., & Abdel-Rahman, M. E. (2013). Psychometric properties and performance of the Oral Health Impact Profile (OHIP-14s-ar) among Sudanese adults. *Journal of Oral Science*, 55(2), 123-132.

Khandekar, S. P., Bagdey, P. S., & Tiwari, R. R. (2006). Oral cancer and some epidemiological factors: A hospital-based study. *Indian Journal of Community Medicine*, 31(3), 157-159.

Khandelwal, A., Neeli, A., Gadiyar, A., & Khandelwal, A. (2017). Assessment of quality of life of patients 1–5 years after treatment for oral cancer. *Indian Journal of Dental Research*, 28(5), 538.

Klassen, A., Wickert, N., Tsangaris, E., Klaassen, R., & Anthony, S. (2017). Health-related quality of life. In *Cancer in Adolescents and Young Adults* (pp. 735-747). Springer, Cham.

Kuyken, W., Orley, J., Power, M., Herrman, H., Schofield, H., Murphy, B., ... & VANDAM, F. (1995). The world-health-organization quality-of-life assessment (Whoqol)-position paper from the world-health-organization. *Social science & medicine*, 41(10), 1403-1409.

Montero-Martín J., Bravo-Pérez M., Albaladejo-Martínez A., Hernández-Martín L. A. and Rosel-Gallardo E. M. (2009) 'Validation the Oral Health Impact Profile (OHIP-14sp) for adults in Spain', *Medicina Oral, Patología Oral y Cirugía Bucal*, 14(1), pp. E44–E50.

Moore, K. A., Ford, P. J., & Farah, C. S. (2014). Support needs and quality of life in oral cancer: a systematic review. *International Journal of Dental Hygiene*, 12(1), 36-47.

Scully, C. (2013). *Oral and Maxillofacial Medicine-E-Book: The Basis of Diagnosis and Treatment*.

Sherman, A. C., & Simonton, S. (2010). Advances in quality-of-life research among head and neck cancer patients. *Current Oncology Reports*, 12(3), 208-215.

Siegel, R., Miller, K. D., & Jemal, A. (2014). Cancer statistics, 2012. *A Cancer Journal for Clinicians*, 64(1), 9-29.

Singhania, V., Jayade, B. V., Anehosur, V., Gopalkrishnan, K., & Kumar, N. (2015). Carcinoma of buccal mucosa: A site specific clinical audit. *Indian Journal of Cancer*, 52(4), 605

Sischo, L. and Broder, H. L. (2011) 'Oral health-related quality of life: What, why, how, and future implications', *Journal of Dental Research*, 90(11), pp. 1264–1270. doi: 10.1177/0022034511399918.

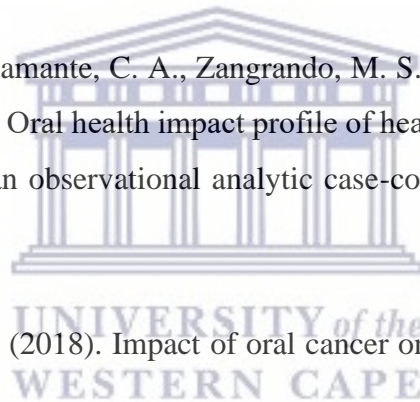
Slade, G. D. (1997). *The Oral Health Impact Profile. Measuring Oral Health and Quality of Life*, 94, 104.

So, W. K. W., Chan, R. J., Chan, D. N. S., Hughes, B. G. M., Chair, S. Y., Choi, K. C., & Chan, C. W. H. (2012). Quality-of-life among head and neck cancer survivors at one year after treatment—a systematic review. *European Journal of Cancer*, 48(15), 2391-2408

Stuani, V. T., Santos, P. S. S., Damante, C. A., Zangrando, M. S., Greggi, S. L. A., Rezende, M. L. R., & Sant'Ana, A. C. (2018). Oral health impact profile of head and neck cancer patients after or before oncologic treatment: an observational analytic case-control study. *Supportive Care in Cancer*, 26(7), 2185-2189.

Valdez, J. A., & Brennan, M. T. (2018). Impact of oral cancer on quality of life. *Dental Clinics*, 62(1), 143-154.

WHO (2006) *Constitution of the World Health Organization* 1. Available at: https://www.who.int/governance/eb/who_constitution_en.pdf (Accessed: 26 April 2019).





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Date 27/08/2019

Appendix 1: Letter to the Clinical Manager of the Tygerberg Hospital

For Attention: Manager: Medical services

Tygerberg Hospital
Tygerberg
7505

Dear Dr Marinus

RE: Application to conduct research study at the Tygerberg Hospital

A Master's student is conducting research as part of his "MSc (**Dental Public Health**)" degree, under the supervision of Dr Dirk Smit in the Dept. of Community Oral Health. The title of the study is "Oral Health-Related Quality of Life (OHRQoL) of Squamous Cell Carcinoma (OSCC) patients".

We will use our findings to compile our results and complete our research project. Ethical approval will be requested from the UWC Research Ethics Committee and from the Western Cape Government, for consideration for registration as an approved research project.

Please do not hesitate to contact me should you require anything further

Yours sincerely

Dr Mohamed Elsheikh

Appendix 2: Participant Information Sheet

Study Title: Oral Health-Related Quality of Life (OHRQoL) of Squamous Cell Carcinoma (OSCC) patients

What is this study about?

This is a research project being conducted by Dr Mohamed Elsheikh at the University of the Western Cape in South Africa. We are inviting you to participate in this research project because you meet the set criterion for the population of interest and your participation will help other people. The purpose of this research project is to evaluate the effect of oral cancer specifically oral squamous cell carcinoma on individual's oral health-related quality of life.

What will I be asked to do if I agree to participate?

You will be asked to sign a consent form agreeing to take part in the study and will be assigned a study participant number, which will keep you anonymous and you will be asked to fill in a questionnaire. Any enquiry regarding the questionnaire will be met immediately by the researcher and if you needed any help filling in the questionnaire it will be provided.

Would my participation in this study be kept confidential?

Your personal information will be kept confidential. To help protect your confidentiality you will be assigned a study participant number to identify your data. Only the researchers will have access to your personal data, which will only be used to make the initial group allocation. Your data and any results we obtain will be kept under password protection and in locked cabinets. Your results and opinions will be kept confidential and no personal data will be made public.

What are the risks of this research?

There are no risks from participating in this research study.

What are the benefits of this research?

You will have the right to benefit from the researcher knowledge and skills.

Do I have to be in this research and may I stop participating at any time?

Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized or be discriminated against.

What if I have questions?

Should you have any questions regarding this study and your rights as a research participant or if you wish to report any problems you have experienced related to the study, please contact: Dr Mohamed Elsheikh (principal investigator) at m-aks2011@hotmail.com, Dr Dirk Smit (Supervisor) at dsmit@uwc.ac.za; tel. 021 937 3085 or Research Ethics Committee at BMREC, UWC, Private Bag x17, Bellville, 7535, Tel: + 27 21 959 4111,

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Appendix 3: Informed Consent Form

INFORMED CONSENT FORM

Title: Oral Health-Related Quality of Life (OHRQoL) of Squamous Cell Carcinoma (OSCC) patients

Dear:

You are being invited to participate in the above-mentioned research study. Please take time to read the information provided. Your participation will involve a self-administered questionnaire that should take no longer than 15 minutes to complete. Participation is voluntary and you have the right to withdraw at any time, to only answer selected questions or to refuse to participate entirely without the risk of penalty or prejudice. There are no risks associated with participation in the study. Please indicate your willingness to participate through completion of the attached declaration on the next page. Should you have any queries relating to participation or the nature of the study, please do not hesitate to speak to the researcher.

The study has been described to me in language that I understand and I freely and voluntarily agree to participate. My questions about the study have been answered. I understand that my identity will not be disclosed and that I may withdraw from the study without giving a reason at any time and this will not negatively affect me in any way.

Yours Sincerely

Participant's name.....

Participant' signature.....

Date.....

Appendix 4: History of Oral Cancer

Collected from patients' files

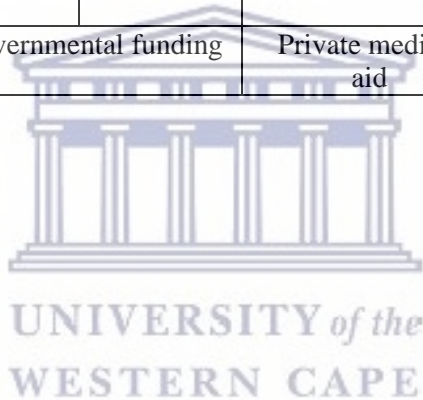
| No | Item description | | | | | | | |
|-----|--------------------------------------|---------------------|-------------------------|--------------------------|---------------------|------------------------------------|-----------|--|
| 1. | Participant no. | | | | | | | |
| 2. | Patient code | | | | | | | |
| 3. | Date of diagnosis | | | | | | | |
| 4. | Main complaint at first consultation | | | | | | | |
| 5. | Clinical staging (T, N, M) | T1 | T2 | T3 | T4 | | | |
| | | N1 | N2 | N3 | N4 | | | |
| | | M1 | M2 | M3 | M4 | | | |
| 6. | Pathological staging (T, N, M) | T1 | T2 | T3 | T4 | | | |
| | | N1 | N1 | N3 | N4 | | | |
| | | M1 | M2 | M3 | M4 | | | |
| 7. | Tumour grade at presentation | Well differentiated | Moderate differentiated | Poorly differentiated | | | | |
| 8. | Location of Tumour | | | | | | | |
| 9. | Date of the last day of treatment | | | | | | | |
| 10. | Stage of cancer | I | II | III | IV | | | |
| 11. | Type of treatment received | | | | | | | |
| | No treatment | Surgery alone | Radiation alone | Chemotherapy + radiation | Surgery + radiation | Surgery + chemotherapy + radiation | | |
| 12. | Follow-up visit | 3-months | 6-months | 9-months | 12-months | 18-months | 24-months | |

Appendix 5: Patient Questionnaire

5.1 English Version

A. Demographic Information

| | | | | | | |
|----|--|----------------------|---------------------|--------------|---------------------------------------|----------|
| 1. | How old are you? | | | | | |
| 2. | In which town / neighbourhood do you stay? | | | | | |
| 3. | Sex | Male | | | | |
| | | Female | | | | |
| 4. | What is your marital status? | Single | Married | Divorced | Widowed | Other |
| 5. | What is your highest level of education completed? | No schooling | Primary school | High school | Tertiary education (e.g., University) | |
| 6. | What kind of work do you do? | | | | | |
| 7. | What is your employment status? | Full time job | Part time job | Unemployed | Student | Retired |
| 8. | What is your household's monthly income? | None | R1-2500 | R2500 - 5000 | R5000 - 10000 | + R10000 |
| 9. | How do you pay for your health care? | Governmental funding | Private medical aid | Pay self | Other | |



B. Oral Health Impact Profile 14 (OHIP-14) Questionnaire

| No | Impact item | Never 0 | Hardly ever 1 | Occasionally 2 | Fairly often 3 | Very often 4 |
|-----|--|------------|------------------|-------------------|-------------------|-----------------|
| 1. | Within the last week, have you had trouble pronouncing words because of problems with your teeth or mouth? | | | | | |
| 2. | Within the last week, have you felt that your sense of taste has worsened because of problems with your teeth or mouth? | | | | | |
| 3. | Within the last week, have you had painful aching in your mouth because of problems with your teeth or mouth? | | | | | |
| 4. | Within the last week, have you found it uncomfortable to eat any foods because of problems with your teeth or mouth? | | | | | |
| 5. | Within the last week, have you been self-conscious (aware of problems with your teeth)? | | | | | |
| 6. | Within the last week, have you felt tense (stressed) because of problems with your teeth or mouth? | | | | | |
| 7. | Within the last week, have you had to interrupt meals because of problems with your teeth or mouth? | | | | | |
| 8. | Within the last week, has your diet (food and drinks that you had) been unsatisfactory because of problems with your teeth or mouth? | | | | | |
| 9. | Within the last week, have you found it difficult to relax because of problems with your teeth or mouth? | | | | | |
| 10. | Within the last week, have you been a bit embarrassed because of problems with your teeth or mouth? | | | | | |
| 11. | Within the last week, have you been a bit irritable with other people because of problems with your teeth or mouth? | | | | | |
| 12. | Within the last week, have you had difficulty doing your usual jobs? | | | | | |
| 13. | Within the last week, have you felt that life in general was less satisfying? | | | | | |
| 14. | Within the last week, have you been totally unable to function? | | | | | |

5.2 Xhosa Version

A. Iinkcukacha ngemeko yentlalo (ukuzilawula ngokwakho)

| | | | | | | |
|----|--|------------------------------|----------------------------|---------------------------------------|---|-------------------------|
| 1. | Mingaphi iminyaka yakho? | | | | | |
| 2. | Ingaba uhlalaphi kweyiphi idolophu okanye ilokishi? | | | | | |
| 3. | Ungaba usesiphi isini? | Indoda | | | | |
| | | Ibhinqa | | | | |
| 4. | Ingaba sithini isimo sakho somtshato? | Awutshatanga | Utshatile | Wohlukene nomtshato wakho | Ungu-mhlolo/ Umhlokokazi | Ikhona enye into |
| 5. | Leliphi ibanga lakho lemfundo eliphezulu oliphumeleleyo? | Zange waya esikolweni | Uphele kumabanga asezantsi | Uphele kumabanga aphezulu | Uphele kwimfundo ephakamileyo enomsila (umzekelo iDyunivesithi) | |
| 6. | Uyintoni umsebenzi wakho? | | | | | |
| 7. | Ingaba ithini imeko yakho yengqesho? | | Uqeshwe Isigxina | Ayisisigxina lo msebenzi | Awuphangeli konke konke | Ungu-mfundi |
| 8. | Ingaba ithini intlawulo yekhaya lakho ngenyanga? | Ayikho | Ukusuka kwi R1-R2500 | Yi R2500- ukuya kwi R5000 | Yi 5000 ukuya kwi R10000 | Nangaphezulu kwe R10000 |
| 9. | Uzibhatala njani indleko zakho kumaziko ezempilo? | Inkxaso ephuma ku Rhulumente | | Ingaba unekhadi lezibhedlele zabucala | Uyazibhatala | Ikhona enye indlela |

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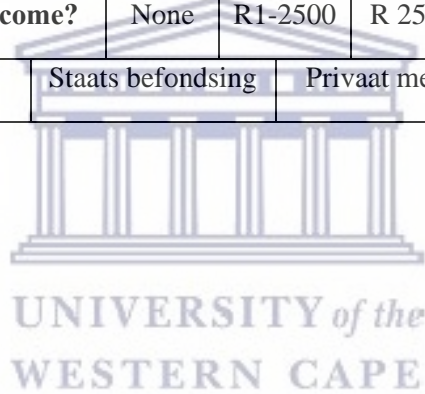
B. Izinto Ezinempembelelo Kwi Mpilo yoMlomo 14 (OHIP-14) (uphando-lolawulo)

| | Izinto ezibenempembelelo | Zange yenzeka | Ayifane yenzeke | Ngamanye amaxesha athile | Yenzeke ngamaxesha athile | Yenzeke kaninzi okanye rhoqo |
|----|--|---------------|-----------------|--------------------------|---------------------------|------------------------------|
| 1 | Kule veki iphelileyo, ubuke wasokola ukubiza amagama ngenxa yeengxaki yamazinyo okanye umlomo? | | | | | |
| 2 | Kule veki iphelileyo, ubuke waqaphela ukuba indlela ongamla ngayo iye yaya ibambi ngenxa yeengxaki yamazinyo wakho okanye umlomo wakho? | | | | | |
| 3 | Kule veki iphelileyo, ubuke wanengqaqambo emlonyeni ngenxa yengxaki yamazinyo okanye umlomo? | | | | | |
| 4 | Kuleveki iphelileyo ubuke wafumana ungakwazi ncam ukutya kakuhle nokuba yeyiphi intlobo yokutya ngenxa yengxaki apha emazinyweni okanye emlonyeni? | | | | | |
| 5 | Kule veki iphelileyo ubuke wanesazela ngenxa yengxaki yamazinyo okanye umlomo wakho? | | | | | |
| 6 | Kule veki iphelileyo ubuke wabamba umzimba ungakhululekanga ngenxa yengxaki zamazinyo okanye umlomo wakho? | | | | | |
| 7 | Kule veki iphelileyo ubuke waphazamiseka ekutyeni yenza lonto ungatyi ngokuqhelekileyo ngenxa yamazinyo okanye umlomo wakho? | | | | | |
| 8 | Kule veki iphelileyo ingaba isidlo sakho besingakonelisi ngenxa yamazinyo okanye umlomo wakho? | | | | | |
| 9 | Kule veki iphelileyo ubuke wazifumana unengxaki yokungakwazi ukuzinza ude ube awuzukonwaba ngenxa yamazinyo okanye umlomo wakho? | | | | | |
| 10 | Kule veki iphelileyo, ubuke waziva ingathi uhlazekile uzive unentloni ngenxa yamazinyo okanye umlomo wakho? | | | | | |
| 11 | Kule veki iphelileyo ubuke waziva ungonwabanga unomsindo ingathi ubucatshukiswa ngabanye abantu ngenxa yamazinyo okanye umlomo wakho? | | | | | |
| 12 | Kule veki iphelileyo, ubuke wanengxaki yokwenza umsebenzi wakho wesiqhelo? | | | | | |
| 13 | Kule veki iphelileyo, ubuke wabuva ubomi ingathi abunantsingiselo? | | | | | |
| 14 | Kule veki iphelileyo, bekuke kwanzima ukwenza nayiphi into? | | | | | |

5.3 Afrikaanse weergawe van vraelys

A. Demografiese inligting

| | | | | | | | |
|----|---|-------------------|-----------------|-----------------------|--------------------|--------------------------------------|-------|
| 1. | Hoe oud is u? | | | | | | |
| 2. | In watter dorp en buurt bly tans? | | | | | | |
| 3. | Geslag | Manlik | | | | | |
| | | Vroulik | | | | | |
| 4. | What is u huwelikstatus? | Enkellopnd | Getroud | Geskei | Wewenaar / weduwee | Ander | |
| 5. | Wat is u hoogste vlak van opvoeding wat u bereik het? | Geen skool gegaan | | Primêre skool | Hoër skool | Tersiêre onderrig (bv. Universiteit) | |
| 6. | Watter tipe werk doen u | | | | | | |
| 7. | Wat is huidige werk status | Wersaam voltyds | Wersaam deelyds | Werkloos | Student | Afgetree | |
| 8. | What is your household's monthly income? | None | R1-2500 | R 2500 - 5000 | R 5000 - 10000 | + R10000 | |
| 9. | Hoe betaal u vir gesondheid dienste? | Staats befondsing | | Privaat mediese fonds | | Betaal self | Ander |



B. Oral Health Impact Profile 14 (OHIP-14) questionnaire

| No | Impact item | Never | Hardly ever | Occasionally | Fairly often | Very often |
|-----|--|-------|-------------|--------------|--------------|------------|
| 1. | In die laaste week, het u gesukkel om woorde uit te spreek agv probleme wat u ondervind met u tande of mond? | | | | | |
| 2. | In die laaste week, het u smaak vermoë versleg agv probleme wat u ondervind met u tande of mond? | | | | | |
| 3. | In die laaste week, het u pyn in u mond ervaar agv probleme wat u ondervind met u tande of mond? | | | | | |
| 4. | In die laaste week, het u ongemak ervaar met die eet van sekere kos agv probleme wat u ondervind met u tande of mond? | | | | | |
| 5. | In die laaste week, het u selfbewus gevoel van u probleme met u mond of tande? | | | | | |
| 6. | In die laaste week, het gespanne gevoel agv van u probleme met u mond of tande? | | | | | |
| 7. | In die laaste week, het u nodig gehad om u maaltye te onderbreek agv van u probleme met u mond of tande? | | | | | |
| 8. | In die laaste week, u gevind dat u dieet onvoldoende was agv van probleme met u tande of mond? | | | | | |
| 9. | In die laaste week, het u dit moeilik gevind om te ontspan agv van probleme met u tande of mond? | | | | | |
| 10. | In die laaste week, het u skaam gevoel voel agv van probleme met u tande of mond? | | | | | |
| 11. | In die laaste week, het u geïrreiteerd met ander mense gevoel agv van probleme met u tande of mond? | | | | | |
| 12. | In die laaste week, het u gesukkel om u daaglikes take of werk te doen agv van probleme met u tande of mond? | | | | | |
| 13. | In die laaste week, het u gevoel dat die lewe in algemeen minder bevredigend (die lewe is nie meer goed nie) agv van probleme met u tande of mond? | | | | | |
| 14. | In die laaste week, het u gevoel dat u glad nie kan funksioneer agv van probleme met u tande of mond? | | | | | |

Appendix 6: BMREC approval



OFFICE OF THE DIRECTOR: RESEARCH RESEARCH AND INNOVATION DIVISION

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11 December 2019

Dr M Elsheikh
Faculty of Dentistry

Ethics Reference Number: BM19/9/17

Project Title: Oral health-related quality of life (QHRQoL) of squamous cell carcinoma (OSCC) patients.

Approval Period: 09 December 2019 – 09 December 2020

I hereby certify that the Biomedical Science Research Ethics Committee of the University of the Western Cape approved the scientific methodology and ethics of the above mentioned research project.

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

Please remember to submit a progress report in good time for annual renewal.

The Committee must be informed of any serious adverse event and/or termination of the study.

A handwritten signature in black ink, appearing to read 'Patricia Josias'.

*Ms Patricia Josias
Research Ethics Committee Officer
University of the Western Cape*

NHREC REGISTRATION NUMBER -130416-050

Appendix 7: Permission Letter from Tygerberg Hospital (PGWC)



TYGERBERG HOSPITAL
REFERENCE:
Research Projects
ENQUIRIES: **Dr GG**
Marinus
TELEPHONE: **021 938 5752**

Ethics Reference: BM19/9/17

TITLE: Oral health-related quality of life (QHRQoL) of squamous cell carcinoma (OSCC) patients.


Dear Dr M Elsheikh

PERMISSION TO CONDUCT YOUR RESEARCH AT TYGERBERG HOSPITAL.

1. In accordance with the Provincial Research Policy and Tygerberg Hospital Notice No 40/2009, permission **cannot be granted** to conduct the above-mentioned research here at Tygerberg Hospital due to the following concerns raised by the Radiation Oncology Department:

- 1.1 Data on Clinical Stage is incorrect;
- 1.2 Data collection for 6 months is inadequate as it is unlikely to get 50 patients for that period;
- 1.3 Questionnaire appears to be too complex for the patient population as many are illiterate;
- 1.4 It is suggested that the questionnaire be translated into Afrikaans and isiXhosa in simple language.

You are welcome to contact Prof Simmonds re above concerns and make the necessary amendments and resubmission for approval by Tygerberg Hospital.


DR GG MARINUS
MANAGER: MEDICAL SERVICES

Dr. G. G. Marinus
MBC, B.MPA,
DHM
MP0370665
Manager: Medical Services

17/04/2020
Date:

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