



Common History of Osteoradionecrosis Patients and Zip Code Impacts Onset

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CPRIT

Introduction

Osteoradionecrosis of the mandible (ORN) is a side effect of radiation therapy (RT) for Head and Neck cancer (HNC) patients. RT puts immense trauma can impact the bone's ability to heal thus resulting in the progressive decay of the mandible. If the condition isn't properly managed then it can result in major damage to the jaw like fractures, infections, and further dental issues. Due to ORN being a rare condition amongst HNC patients there is limiting knowledge of the disease. This study investigated common history and trends of ORN patients using an anonymized dataset from MD Anderson Cancer Center (MDA).

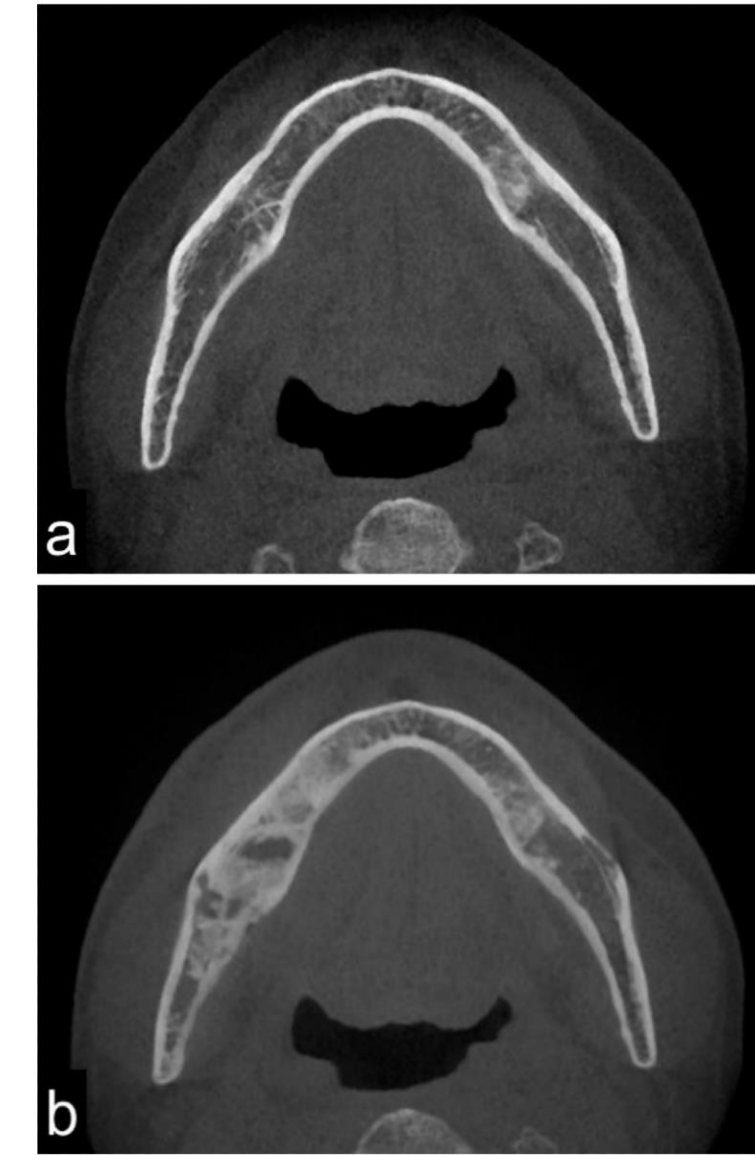


Figure 1. Pre-treatment mandible on axial computed tomography (CT) scan (a) and osteoradionecrosis (ORN) mandible on axial CT scan (b). The image shows bony sclerotic changes with ORN (b) involving the right mandible compared to the pre-treatment mandible in the same lesion without periosteum reaction (arrowhead). These reactions may have been induced by irradiation.

Methods

We used an anonymized dataset of 30 MDA ORN patients. This investigation was twofold. First, we examined medical history along with comorbidities to determine common traits between the different cases. Then, we investigated patient area of residence to discover if there were any environmental factors that could contribute to the onset of ORN. Our inclusion criteria for patients were those who lived in Texas. We used US Census Data to connect the patient's resident to the domains of Social Determinants of Health (SDOH). SDOH are the conditions in the environments where people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks. By investigating the SDOH for the patients we can understand how their environment plays a role.

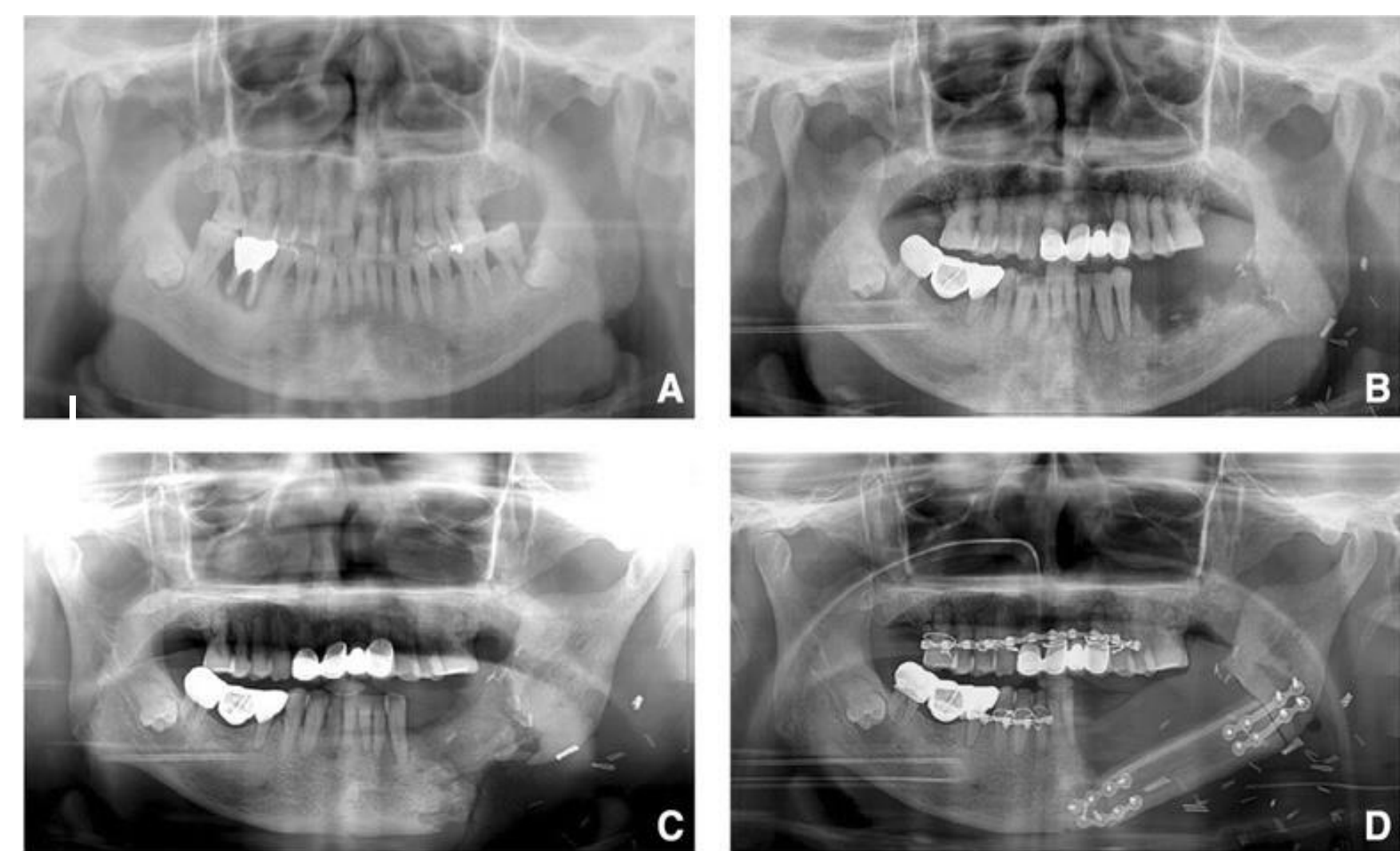


Figure 2. Panoramic view of the osteoradionecrosis progression. (A) Preoperative panoramic view of patient who extracted left 3rd molar 5 years before the operation. (B) Panoramic view after 3 years from left 3rd molar extraction. (C) Left mandible angle fractured after 5 years from extraction. (D) Postoperative panoramic view.

Social Determinants of Health



Figure 3. SDOH also contribute to wide health disparities and inequities. For example, people who don't have access to grocery stores with healthy foods are less likely to have good nutrition. That raises their risk of health conditions like heart disease, diabetes, and obesity — and even lowers life expectancy relative to people who do have access to healthy foods.

Results

From the medical history of 30 patients there were six common comorbidities: Smoking History (19), Hyperlipidemia (12), Hypothyroidism (11), Hypertension (10), GERD (8), Diabetes (5), HPV Status (21) and Dental Extractions (22). Most patients resided in large metropolians (DFW, Greater Houston, Greater Austin). From the census data, these regions had a higher income, well-educated population, and better access to healthcare in comparison to the average American.

Comorbidities

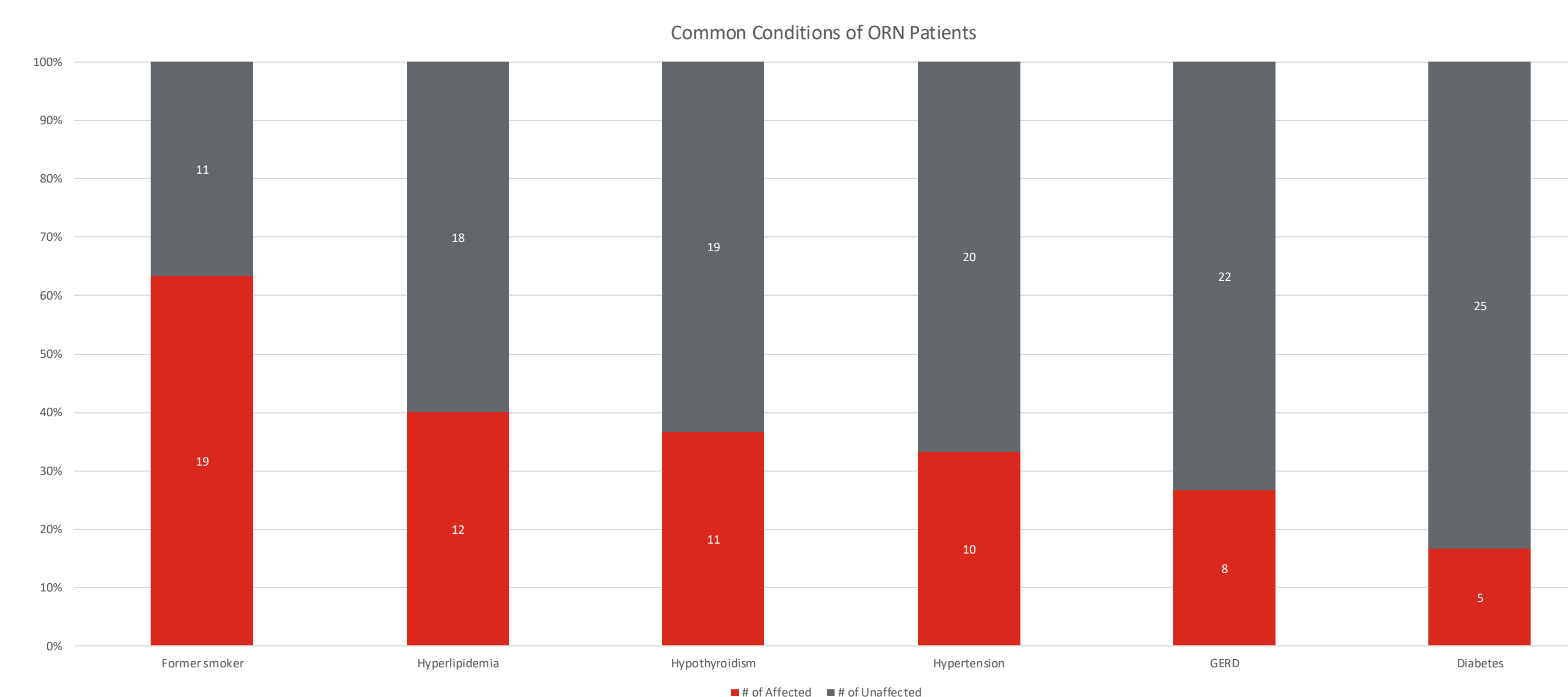


Figure 4. MD Anderson provided anonymized data on 30 patients whom all developed ORN, and amongst the most of these comorbidities are related to HNC as smoking is a big contributing factor while hyperlipidemia and hypothyroidism are side effect of RT after treatment.

Human Papillomavirus (HPV)

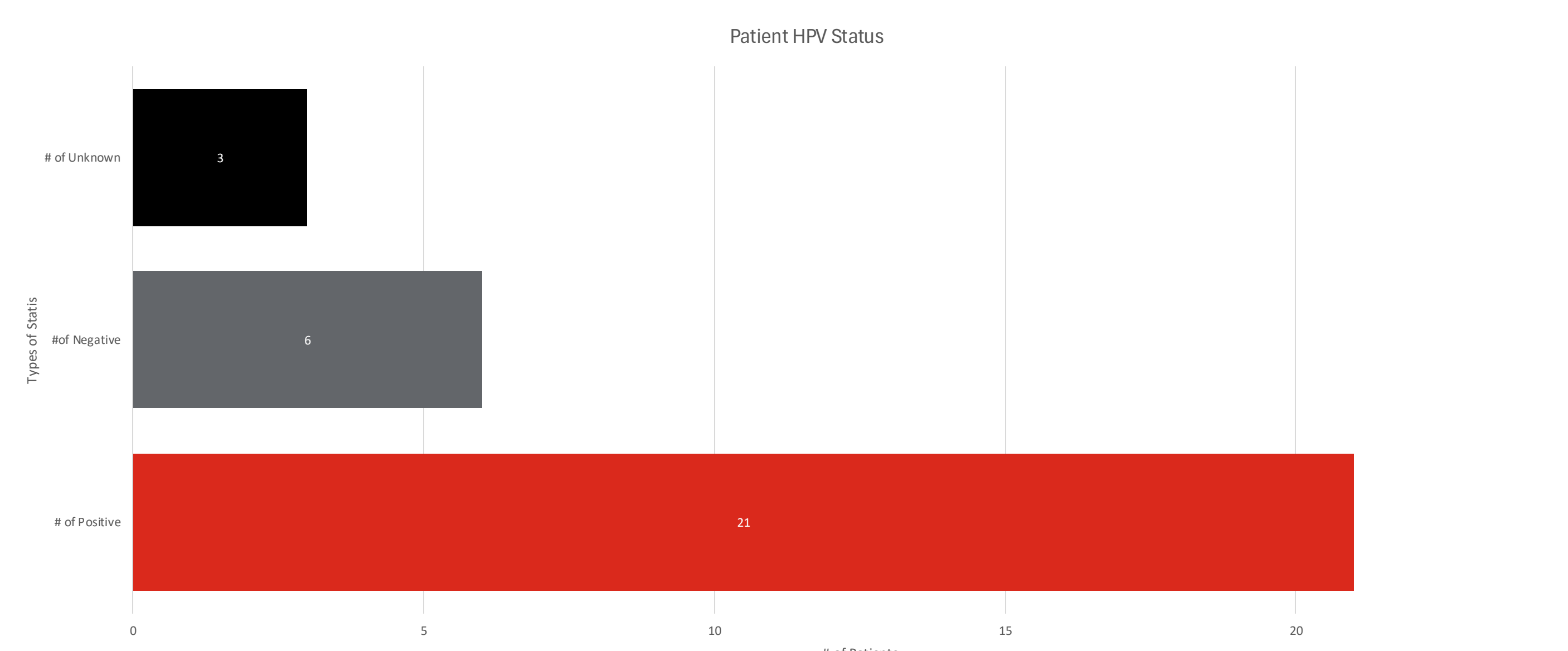


Figure 5. We discovered 70% of the patients were confirmed to have human papillomavirus (HPV) an STI that can lead to cancer. Due to HPV being and STI it's possible for someone to develop cancer in a younger age demographic than most HNC patients. If a patient develops cancer at a young age they can receive a better prognosis but at the cost of a much longer survivorship.

Dental Extraction

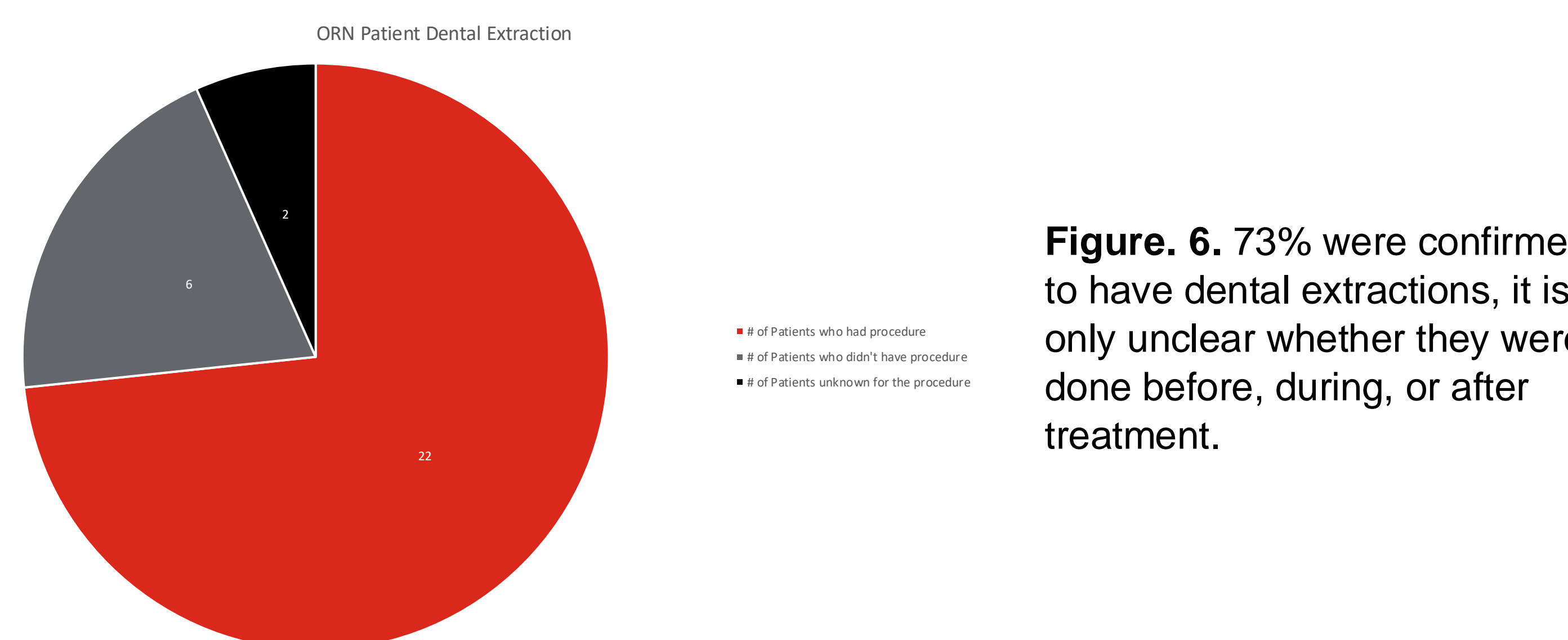


Figure 6. 73% were confirmed to have dental extractions, it is only unclear whether they were done before, during, or after treatment.

Results (...)

Zip Code Data

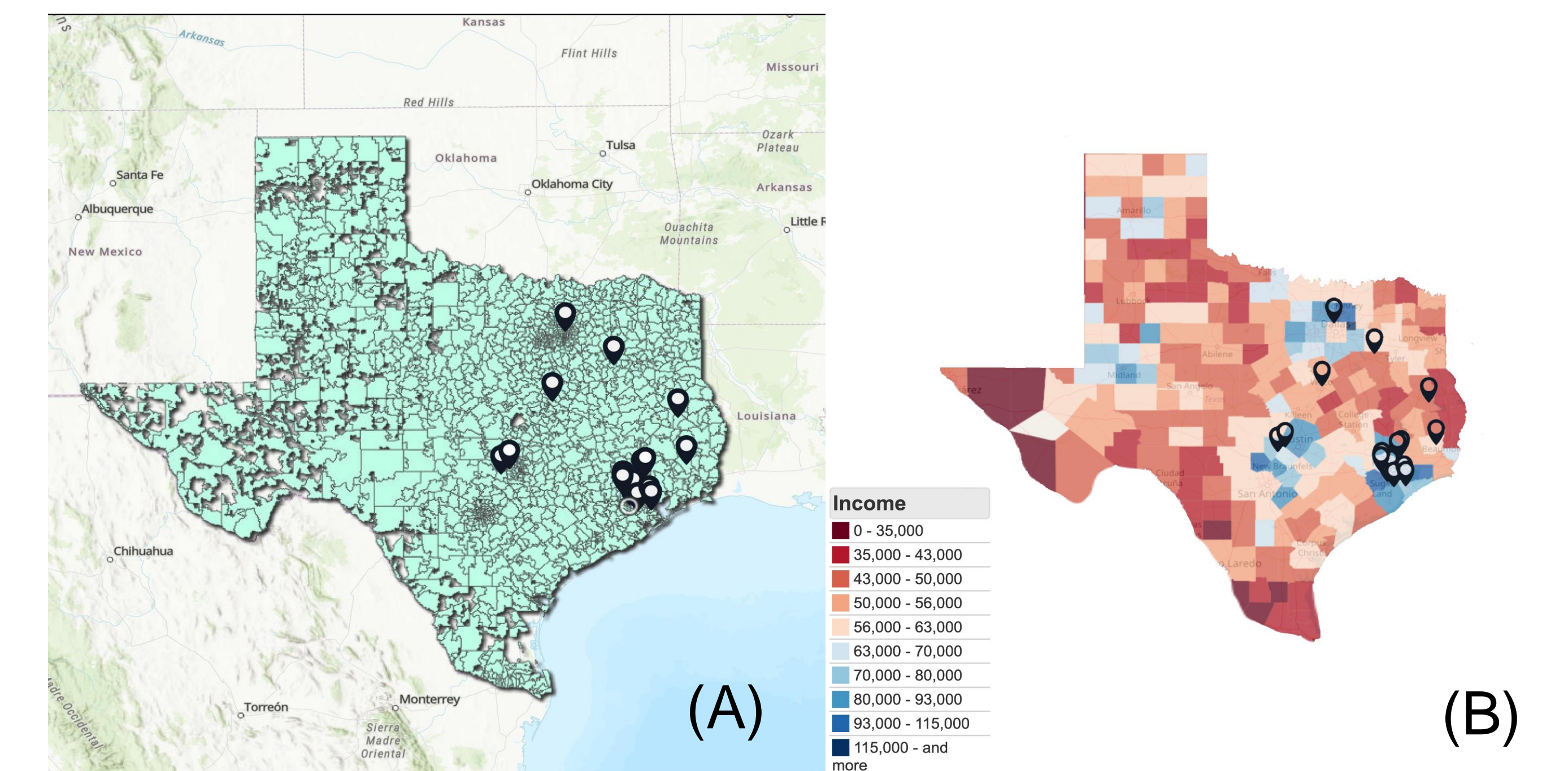


Figure 7. (A) Looking at the patient's zip codes and exploring their areas residence, (B) they come from large urban environments with high income households (\$94,208±34,304) and the people in the communities were well educated. For the US Census Data, I focused on the Texas residents since they made up the majority (63%). The bulk of the patients resided in the big 3 metropolians of Texas Dallas-Fort Worth, Houston, and Austin. These area of highly active economically, healthcare access, and socially so it's logical that these patients would go to MD Anderson

Conclusions

Using RT to treat HNC results in side effects and from this study we are building towards a better understanding of patients likely to develop ORN. ORN is a rare side effect that has no direct path of development, but rather a complication of certain medical conditions. From the 30 patients there were several comorbidities seen amongst their records that played a role in their HNC. What stood out in the record is the HPV status and dental extractions for many of the patients as at least 70% of the patients had this history. There weren't any negative environmental factors that contributed to ORN, since the patients are mostly derived from higher income areas their health outcome are much better. Which explain why they came to MDA for treatment, a high level facility that is best ranked in the world. Despite the limits of the project, we creating a better idea of who is more likely to get ORN.

Next Steps

With a big focus on SDOH the project can be expanded by diversify the patient's database, MDA has limits to it patient pool due to many of the patients for the project being older, higher income Caucasian male. If we were to expand the database to more health facilities like Harris Health and CHI St. Lukes we can diversify the data and allow for a more unbiased investigation on the patients SDOH. In addition we could potentially see a differing medical record from what was generally seen with the current dataset.

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References

