Social Impact of Dental Caries on Adult Patients in Bungoma County, Kenya

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ABSTRACT

Dental caries manifests itself through the existence of a hole in the hard tissue of teeth, and it has a brown or black colour. Untreated dental caries causes a lot of challenges such as toothache and eventually tooth loss resulting in swelling, inability to eat or swallow, inability to open jaw or talk, difficulty in breathing and low self-esteem as a result of the bad breath from cavity. The outcome of the social effect of dental caries is the inability to pronounce or talk, inability to chew, sleep disruption due to pain and difficulty in breathing especially for those who use the mouth to breathe. In Bungoma County, little is known about the social impact of dental caries among patients. Therefore, there was a need to investigate the social impact on adult patients in Bungoma County, Kenya. This study was conducted in Bungoma County. The study adopted a descriptive cross-sectional study design. Adults with dental challenges and the dental staff formed the study population. The sample size was 347 dental patients. The sampling strategy was proportionate probability sampling and simple random sampling. Data was collected using a pretested WHO-modified assessment questionnaire of 2013, WHO-modified observation checklist and key informant interviews. Data was analysed using descriptive and inferential statistics with the aid of the Statistical Package for Social Sciences tool (SPSS) v 25.0. Data was presented using tables, figures, narratives and verbatim. Association and strength between the variables were assessed using correlation, multiple regression and logistical regression at 0.05. Thematic analysis was used to analyse qualitative data. Results: The burden of dental caries according to sociodemographic was as follows: youth < 35 years was 60%, the female was 57.4%, rural dwellers had 56.8% and low-income earners had 65.6%. The study established that poor oral hygiene habits (OR: 1.2) frequent consumption of sugary food (OR: 1.0) and smoking contributed (OR: 0.8). Toothache due to cavity was 97.9% and tooth loss was 40.4% while bad breath was reported by 60.7%. There was a significant strong positive association between the level of teeth loss and the level of pain experienced by a patient with dental caries, (r (347) = 0.86, p < 0.001). the study concluded that dental caries was more prominent in those with poor oral hygiene practices, those who frequently consume sugary foods and those who smoke tobacco. Toothache, tooth loss and bad breath were the major social impacts of dental caries that affect the quality of the affected. The study recommended that community members should be informed to foster a habit of attending dental clinics occasionally at least once a year for a check-up.

Keywords: *Bungoma, Caries, Dental treatment, Tooth Decay*

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I. INTRODUCTION

Dental caries results from the frequent interaction of the tooth surface, bacteria, and sugary foodstuffs over time (Kassebaum et al., 2017). It manifests itself through the existence of a hole in the hard tissue of teeth, and it has a brown or black colour (Otto, 2017). Inflammation occurs in the mouth, and the infection causes tissue death in the pulp chamber.

The occurrence of dental caries differs in countries, population groups, age, gender, residence, socioeconomic status and oral hygiene practices in sub-Saharan Africa (Elidrissi & Naidoo, 2016; Birungi et al., 2020; Zewdu et al., 2021). The Prevalence of tooth cavities differed by age, gender, diet, and lifestyle choices such as tobacco smoking and oral hygiene practices (Abbass et al., 2019).

Reduction of sugary foods and good oral hygiene are among the preventive measures to mitigate dental caries; however, it is hardly practised (Watt et al., 2019). Dental caries is an oral disease with a huge socioeconomic effect which has an association with lifestyle, especially tobacco smoking, oral hygiene practices and dietary patterns (Gao et al., 2016). In poor countries, people experience reduced quality of life as a result of suffering from dental caries (Andegiorgish et al., 2017). In these countries, there is a vast difference between urban and rural populations in terms of access to quality dental care (Ndagire et al., 2020).

The social effect of dental caries includes toothache, tooth loss and bad breath (Akaji, 2014). The outcome of the social effect of dental caries is the inability to pronounce or talk, the inability to chew, sleep disruption due to pain and difficulty in breathing especially for those who use the mouth to breathe (Pakpour et al., 2017). The alteration of speech and facial appearance leads to low self-esteem and low social acceptance (Echeverria et al., 2022). Loss of teeth (edentualism) had been the most common form of morbidity (Perez et al., 2020). Tooth loss was ranked among the top one hundred conditions that affect the population (Ribeiro et al., 2016). Tooth loss leads to the loss of chewing function, poor aesthetics and reduced quality of life (Gomes et al., 2018).

Tooth decay affects social interactions, the ability to chew and general health (Gil-Montoya et al., 2017). Teeth are essential in chewing varied foods before digestion. The other importance of teeth is to support the check muscle and enhance appearance (Aillon et al., 2020). They played an important role in talking as it enabled the pronunciation of some letters. The study by International Collaborative Study of Oral Health Systems revealed that patients over the age of 18 years reported impaired social functioning as a result of a cavity by, avoiding to laugh or smile due to poor perceived funny dentition (Schmalz et al., 2020).

1.1 Statement of the Problem

The social implication of dental caries is an orally unhealthy person who suffers from mouth and facial pain, is free from tooth decay and has not lost any tooth and no any other disease or disorders that may limit his/her ability to bite, masticate, smile, speak properly and overly his/her psychosocial well-being (WHO, 2017). Previous studies indicate that dental patients bear socio-impact as a result of dental caries hence affecting their oral health-related quality of life (Ismail et al., 2015; Weiner et al., 2018). If caries is left untreated, the patient suffers toothache and eventually tooth loss resulting in swelling, inability to eat or swallow, inability to open jaw or talk, difficulty in breathing and low esteem as a result of the bad breath from the cavity (Chen et al., 2017). The social impact of dental caries among adults in Bungoma County is unknown. Thus, there was a need to assess the social impact among adult patients in Bungoma County, Kenya.

II. LITERATURE REVIEW

2.1 Social effect of dental caries

The oral disease leads to reduced quality of life among the population although the magnitude is not much documented. The main social outcomes of dental caries are toothache, tooth loss and bad breath (Haag *et al.*, 2017). A report by WHO revealed that oral health related to quality of life is a significant element of the quality of life. Dental caries affects self-esteem, and aesthetics due to the collapse of the facial and buccal profile, and the ability to chew and pronounce words properly.

2.2 Toothache

Toothache occurs from untreated dental caries and impacts on daily activities of an individual (Alsubaie, 2019). Toothache is a common effect of dental caries and it affects self-esteem and oral health-related quality of life (Wang et al., 2019). Toothache symbolizes severe caries hence expensive to treat. Toothache from untreated caries affected school attendance, eating, speaking and subsequently impaired growth and development (Felipak et al., 2020). Pain due to dental caries led to diminished quality of life, which was associated with lack of sleep, inability to open the mouth and multiple psychosocial outcomes (Paiva et al., 2021). Toothache led to the modification of diets, speech and general well-being (Benoliel et al., 2019). The level of toothache influenced dental clinic attendance and the urgency of the treatment (Groisman et al., 2023).

Toothache is the most common symptom of untreated dental decay (Page et al., 2021). A study in Tanzania revealed that a lot of people suffered from pain and discomfort and only a handful of those sought oral care due to financial constraints. Toothache prevalence worldwide has been reported between 5% to 88% (WHO, 2019). The prevalence of toothache in the previous studies varied with populations and geographical locations with 24.3% in Brazil among people aged 35-44 years (Santos et al., 2020). The prevalence was 58.8% in Tanzanian among adults aged 18-

92 years (Zewdu et al., 2021). In Iran, the Prevalence of halitosis among people aged ≥18 years was 11.7 % (Alsubaie, 2019).

2.3 Tooth Loss

Tooth loss in adults is a reflection of an individual's dental history and the accessibility and affordability of dental treatments. Over the years the level of tooth loss globally is still rampant (Chen & Gao, 2017). Tooth loss leads to reduced mastication function, altered facial appearance due to collapse of the lip and buccal muscle and low self-esteem (Cheng *et al*., 2019). The level of tooth loss increases with age group (Da Fonseca & Avenetti, 2017). The prevalence of tooth loss due to cavities was 80.5%. Gradients in OHRQoL increased according to the number of teeth lost and their position (Silva-Junior *et al*., 2019).

A study by Sohal showed the main reason for tooth loss through extraction of teeth was tooth pain which was aggravated by the inability to afford another treatment option. Severe dental caries result in tooth extraction. According to a study by Braimoh & Alade, there was no case of complete edentulousness and the prevalence of tooth loss was 43.6% (Braimo & Alade, 2019). The study revealed that the level of tooth loss was higher in males and older age groups. Tooth loss was higher in the upper anterior segment (14.2%) than in the lower anterior segment (13.3%) (Bashiru & Ovenashia, 2019).

2.4 Bad Breath (Halitosis)

Bad breath, is an oral health condition that presents with an offensive smell in the mouth and is mostly noticed by others (Kapoor *et al*., 2016). The condition is caused when dental caries advances to the pulp of the teeth, food packing in the cavities, ill-fitting dentures and other restorations and generally poor oral hygiene practices (Nazir & Almas, 2017). Bad breath is a serious condition in dentistry as it interferes with esteem and the ability to form relations and communicate with other people (Damayanti *et al*., 2022).

Globally, a lot of people suffer from bad breath although some people think they have when clinically no indication for bad breath (pseudo halitosis). Some people have bad breath but are not aware and they do not acknowledge having it (denied halitosis) (WHO, 2015). A study by Akaji showed that 28% of patients complaining of bad breath did not have clinical signs of bad breath (Akaji *et al.,* 2014). Studies have shown varied levels of bad breath in different regions of the world with 42% in Japan, 23.6 % in Korea, 32% in Switzerland, 53.5% in Italy and 22.8% in Saudia Arabi (Nomura *et al*., 2019; Kim *et al*., 2016; Grieshaber *et al*., 2022).

Research by Guedes revealed that halitosis was relatively high in rural residents and low-income earners at 72.3% and 52.2% respectively (Guedes *et al*., 2019). The prevalence of halitosis was high in adults with dental caries, poor oral hygiene practices and smokers at 83%,80%and 75% respectively (Sedky, 2017). Bad breath was high in smokers with smokers being 2.69 times more at risk of developing halitosis than non-smokers. Bad breath is due to poor oral hygiene practice and calculus accumulation in patients (Panicker et al., 2015).

III. METHODOLOGY

Bungoma County was purposively selected to study the social impact of dental caries among adult patients. There were limited studies on oral health that necessitated this study (GoK, 2015). This study was conducted at two major public hospitals in Bungoma County which are the main dental referral centres in the county. These hospitals were Kimilili Sub County Hospital and Webuye County Referral Hospital. The selected hospitals, therefore, were representative of Bungoma County's population since they are the main public dental referral centres and would effectively give a glimpse of the social impact of dental caries among adult patients in Bungoma County. The study was guided by a descriptive cross-sectional research design. This research design was used to provide a snapshot of the social impact of dental caries among the adult populations in Bungoma County.

The study population comprised adult patients and dental staff. A study on adult patients enabled the generation of evidence on the final burden of dental caries on the general population during the entire life cycle (Page *et al.*, 2016). The target population was 700 adult patients who visit the dental clinics at the selected hospitals monthly District Health Information System (DHIS).

The sampling strategy used was – purposive sampling and proportionate probability simple random sampling. Purposive sampling was used to select only dental patients who were 18 years and above. Proportionate probability simple random sampling was used to ensure representation in corresponding proportions had an equal chance of selection. Kimilili Sub County Hospital had 200 patients and Webuye County Referral Hospital had 147 making a total of 347 dental patients recruited for the study. Simple random sampling was the final sampling technique that was used

until the desired sample size was achieved. Different numbers were assigned to each adult from a list of random numbers that were generated using Microsoft Excel software. Cochran's formula (Cochran, 1977) to calculate the sample size of 347.

Data collection was achieved using the WHO oral health assessment form for adults (2013), and key informant interviews. These tools were used to collect data on the social impact of dental caries. A pilot study was conducted at Bungoma County Referral Hospital. This hospital was not included in the actual study. The reliability score was 0.874 and the researcher used content validity to measure all possible items that measured the concept. Data analysis was done with the aid of Statistical Package for Social Sciences (SPSS) Version 25. Descriptive analysis was done for basic variables that described the respondents to show the total number of responses and frequency of distributions. Analytically, correlation and multiple regression were used, correlation was used in objective two and logistical regression was used in objective three. Data was presented in frequency tables and figures.

Ethical consideration was sought from the approval to conduct this study from the Masinde Muliro University of Science and Technology (MMUST), the County Government of Bungoma where the study was conducted and further permission was sought from the National Commission of Science, Technology and Innovation (NACOSTI). The principal investigator adhered to the rules and regulations as stipulated in the Nuremberg Code, the declaration of Helsinki and NACOSTI, notwithstanding the Directorate of Postgraduate Studies of MMUST. Specifically, the principal investigator adhered to the four pillars of medical ethics namely: autonomy, non-maleficence, beneficence and justice. Informed written consent was sought from the respondents prior to participation in the study

## IV. FINDINGS & DISCUSSIONS

4.1 Findings

This study investigated the social impact of dental caries on adult patients, which sought to establish the level of toothache, tooth loss and bad breath.

"The major social effects of dental caries are toothache, tooth loss and bad breath and any other social effect such as low self-esteem, inability to chew, poor aesthetics and inability to pronounce is as a result of the major social effect"

### 4.1.1 Level of Pain Experienced by the Patient

The study in Figure 1 established that 30.1% (104) had mild pain experiences, 67.8% had severe pains and 2.2% (8) had no pain experiences.
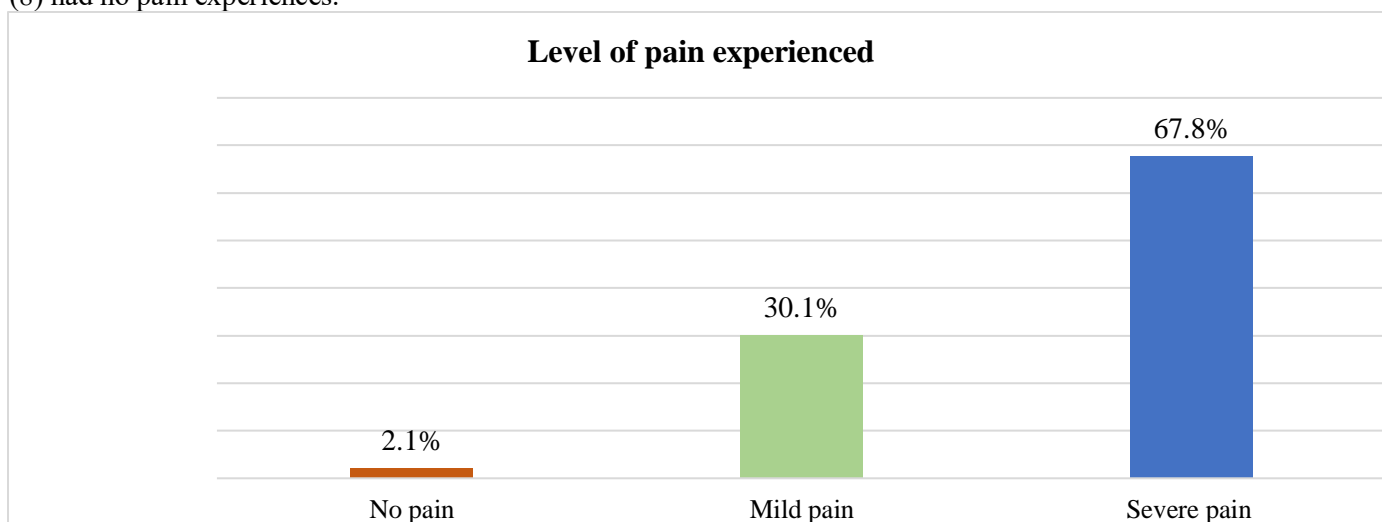
Figure 1
Level of pain experienced

4.1.2 Level of Pain Felt When Eating or Chewing

Teeth are important in biting and chewing or tearing food; thus, it was of grave importance to establish the level of pain during eating or chewing. According to the findings in Figure 2, 70.5% (245) of the participants had severe pains when eating or chewing. About 20.9% (97) had a mild level of pain when eating or chewing and 8.6% (6) felt no pain during eating and chewing.
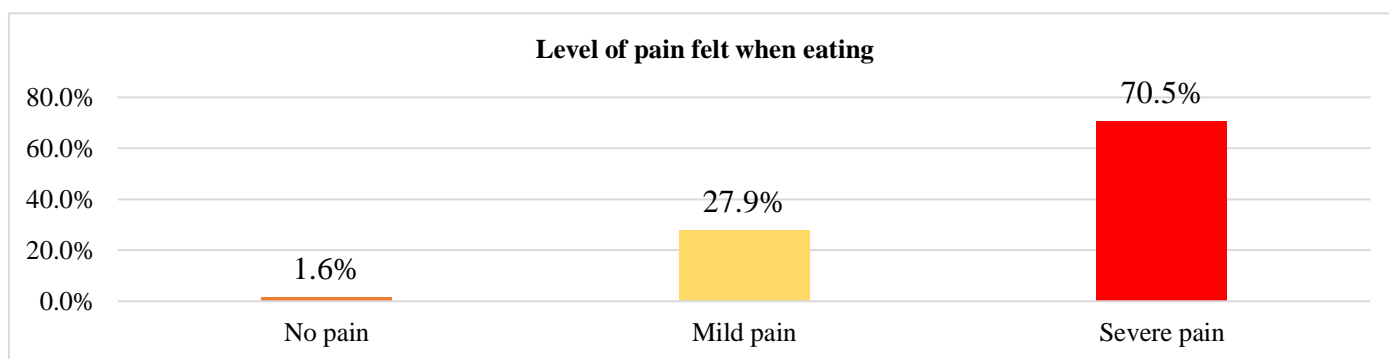
Figure 2
Level of Pain felt when Eating or Chewing

Key informant on the level of pain
> "The level of toothache differs in terms of mild or severe. Severe pain disrupts your normal activities especially sleep and ability to chew."
> "The level of pain is a good indicator of the severity of the dental caries coz caries is usually painless in the initial stages but once the pain sets in then it means the cavity is severe and the pulp is exposed."

4.1.3 Tooth Loss Noticed Among the Participants

The research sought to determine the relationship between tooth loss and demographic characteristics. It was revealed that participants aged less than 35 years (28.2%) had more noticeable tooth loss than participants aged more than 35 years (12.7%). Gender-wise, it was revealed that the female participants were leading in tooth loss (36.9%) than the male counterparts (19.6%). Marital status showed that married participants (40.3%) had more noticeable tooth loss as compared to the single participants (8.6%), widow participants (2.3%) and divorced participants (0.6%). Participants from rural areas had more noticeable tooth loss (28%) as compared to urban participants (11.5%). Participants with formal education had the most noticeable tooth loss (21%) as compared to participants with informal education (0.3%). Finally, it was revealed that participants with an income of less than Kes 24,000 had noticeable tooth loss (25.9%) as compared to participants with an income of more than Kes 24,000. Table 1 summarises the results.

The researcher computed an Odds ratio to determine the association between tooth loss and sociodemographic characteristics.

Table 1
Tooth Loss According to Sociodemographic

Socio-Demographic characteristics		Missing teeth n	No Missing teeth n	OR	95% CI		P value
					Lower	Upper	
Age	≤ 35	98	108	0.32	0.26	0.39	0.00
	>35	44	97				
Gender	Male	68	80	0.054	0.028	0.106	0.00
	Female	128	71				
Marital status	Married	140	207	0.433	0.376	0.500	0.00
	Not married	40	60				
Residence	Urban	40	110	0.067	0.037	0.121	
	Rural	97	100				
Education	Formal	72	267	0.586	0.536	0.641	0.012
	Informal	1	8				
Formal income (Monthly salary)	Kes 23,750 and below	90	29	10.857	7.223	16.319	0.00
	Above Kes 23,750	24	204				

The researcher computed crosstabulation of the tooth loss and the sociodemographic characteristics. The findings are summarized in Table 1. The findings show that the age, gender, marital status, place of residence and education level of the respondents had a significant decreasing association with tooth loss. This meant that tooth loss

was influenced by other factors other than age, gender, marital status, place of residence and education level. However, income had an increasingly significant association with tooth loss such that it was 10 times more likely to influence tooth loss through extraction from lower earners of Kes 23,750 and less as compared to monthly income of Kes 23,750 and above. Further, it showed that high-income earners would prefer other ideal interventions such as tooth filling (either temporary or permanent). It was revealed that age, gender, marital status, place of residence and education had a decreasing association with tooth loss. This was a hospital-based study thus the participants had come for dental health care services showing that only the level of income influenced the dental care option – tooth extraction.

General tooth loss from the participants interviewed was 40.4%. The findings are presented in Figure 3.
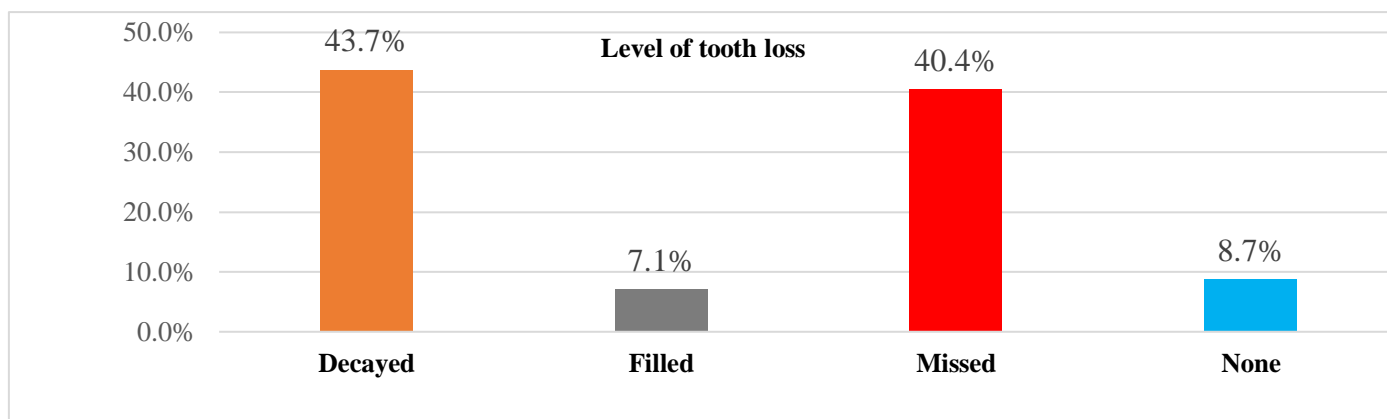
Figure 3
Level of Tooth Loss

Key informant on the level of tooth loss
> "Tooth loss is the final marker of dental caries disease; it communicates on the economic position of the client and the accessibility to dental care."
> "Tooth loss leads to collapse of the facial profile dues to loss of the buccal and lingual support that the teeth offer hence makes one look soo old."
> "Tooth loss has led to diet modification as the teeth play an important role in food chewing."

4.1.4 Tooth Loss According to Jaw- Upper and Lower Jaw
The study determined the tooth loss in terms of the jaw morphology of the upper and the lower jaws. Descriptive statistics in Table 2 showed that the upper jaws had 37 teeth missing from the participants and the lower jaws were missing 103 teeth from the participants. This indicated that lower jaws were more susceptible to missing teeth as compared to upper jaws. Lower jaws are used for food-holding considering their morphology i.e., have fissures that tend to keep food particles for longer hence without proper oral hygiene practice lead to carious teeth.

Table 2
Tooth Loss According to Jaw Morphology - Upper and Lower Jaws

Tooth loss	Frequency (n 347)		Total	OR	95% CI		P value
	Missing	No missing			Lower	Upper	
Lower Jaw	103	152	255				
Upper Jaw	37	55	92	5.313	4.117	6.855	0.000
Total	140	207	347				

Moreover, the researcher computed the odds ratio to determine the association between tooth loss and jaw morphology. It was revealed that there was an increasing association between tooth loss and jaw morphology (OR = 5.31, 95% CI [4.12 – 6.86], p < 0.001). Therefore, this study revealed that the lower jaws were 5.3 times more likely to be affected by caries than the upper jaws.

**4.1.5 Tooth Loss on Posterior and Anterior Segments**

The study found that 73.4% of the dental patients had missing teeth from the posterior teeth and 26.6% had missing teeth from the anterior teeth. Figure 4.
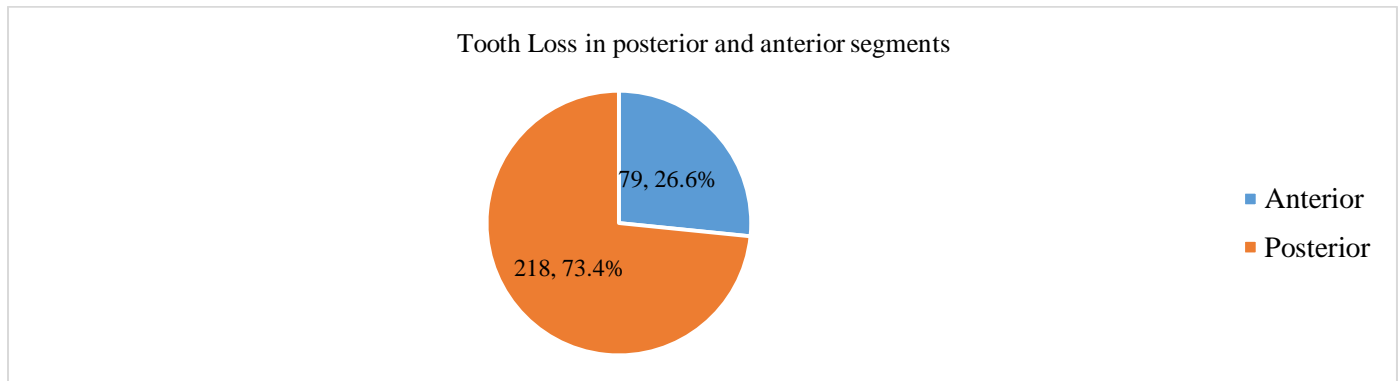
Figure 4
Showing Missing Teeth on the Posterior and Anterior

4.1.6 Bad Breath

On the bad breath, the research determined the levels of bad breath in patients and the results were as follows: It was revealed that bad breath was noticed in 60.7% (92) of the dental patients, but 39.3% of the patients did not have bad breath. Figure 5 illustrates the findings.
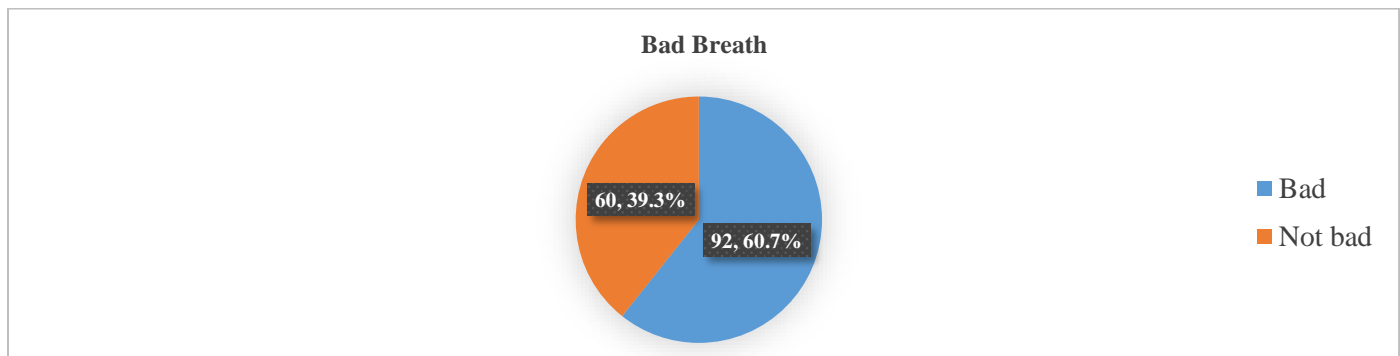
Figure 5
Bad Breath from Dental Patients

The key informant on bad breath

"Well, most patients who have bad breath in most cases have cavities in their teeth and the bad breath usually emanates from the food that has been packed in the cavity"

"Just like dental caries bad breath is more prevalent in the female gender and it causes a lot of self-esteem issues and even affects relationships"

4.1.7 Bad Breath within the Gender

Female participants were the majority with bad breath as compared to male counterparts. The findings are presented in Figure 6.

Bad breath by gender

48.9%
51.1%

Male   Female

Figure 6
Bad Breath with Dental Caries

Among those with dental caries (43.7%), the level of bad breath was determined and the results were that 80.8% had bad breath while 19.2% had no bad breath. Among those that did not have caries, (56.3%) the level of bad breath was 8%.

4.1.8 Bad Breath and Self-Esteem
The researcher sought to establish the influence of bad breath on the self-esteem of patients. The study established that at least 69.4% had low self-esteem because of bad breath. Figure 7 presents the findings from the dental patient participants.

Self esteem

106, 30.6%
241, 69.4%

■ Low   ■ High
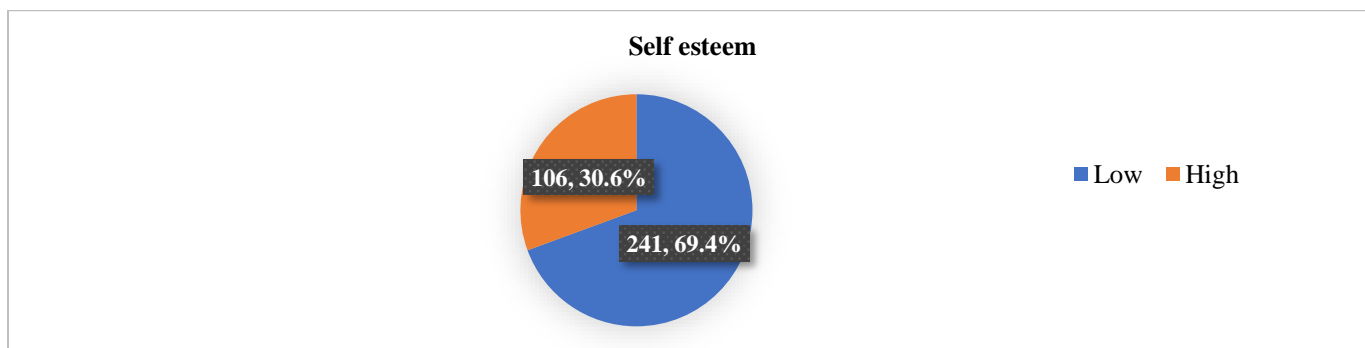
Figure 7
Self-Esteem and Bad Breath

4.1.9 Social Impact of Dental Caries
According to the opinion of the key informants on the social effect of dental caries were as follows, 93.3% (14) felt that tooth decay led to toothache, tooth loss and bad breath. di Moreover, 66.7% of the key informants observed that tooth decay led to teeth loss. The decay and loss of teeth also led to low self-esteem. The findings are presented in Table 3.

Table 3
Social Effect of Dental Health Status

Social Effect of Dental caries		Frequency (n)	Per cent (%)
Toothache, tooth loss and bad breath		14	93.3
	Low esteem	11	73.3

Results presented in frequency (n) and proportions (%); n=15
It was stated by the key informant that:
"… Halitosis is a major problem that is mainly caused by cavities, poor oral hygiene and smoking."

4.1.10 Correlation Test of The Level of Toothache and Level of Teeth Loss to a Dental Patient

The researcher performed a correlation test to establish whether the level of tooth loss had a significant contribution to the level of pain. According to Table 4, the Pearson correlation indicates that there is a significant strong positive association between the level of teeth loss and the level of pain experienced by a patient with dental caries, (r (347) = 0.86, p < 0.001). Also, it was revealed by the Pearson correlation that there is a significant positive marginal association between the level of pain experienced and the level of pain felt when eating or chewing.

Table 4
Correlations Between the Level of Teeth Loss and the Level of Pain

Correlation		Level of tooth loss noticed	Level of pain experienced
Level of pain experienced	Pearson Correlation	0.858**	
	Sig. (2-tailed)	0.000	
	N	347	
Level of pain felt when eating	Pearson Correlation	0.109	0.220**
	Sig. (2-tailed)	0.141	0.003
	N	347	347

**. Correlation is significant at the 0.01 level (2-tailed).

4.2 Discussions
4.2.1 Level of Pain Experienced by the Patient

The patients who attended dental clinics were influenced by the severe pains experienced. Considering the extent of pain, toothache is a social problem that causes a lot of discomfort, thus, destroying the peace of a person. It was noted that the patients with mild pains were not many at the dental clinic. This could be because most of the patients assume the mild pains until they develop into a severe level when they attend dental clinics. Besides, mild pains are normalised by the patients. Such behaviours have normalised the conditions, Key informants stated that tooth decay led to discomfort among various patients. The discomfort led to many patients changing or modifying their eating and diet habits. Toothache is of grave importance as it helps in the diagnosis and treatment preferred for the patient (Currie, 2022). Besides, toothache shows the lack of poor oral hygiene among dental caries patients. This was also observed in Tanzania by Page et al. (2016) that the symptoms of poor oral hygiene were tooth decay.

4.2.1 Level of Pain Felt when Eating or Chewing

Teeth are known for biting and chewing or tearing food. Because of the important role played by these teeth, laxity in keeping them clean exposes individuals and serious and deleterious conditions that may even lead to teeth loss. It is against this that the study sought to determine how the level of pain affected social impact. The surveyed dental patients report having felt severe pains when eating or chewing. The habit of seeking medical services in time is one of the limiting factors in addressing the development of dental caries that eventually affect the social well-being of an individual. It was observed from the expert opinion that the decayed teeth led to the inability to eat due to the level of pain that was felt. Paiva et al. (2021) stated that toothache contributed to low quality of life such as affected sleep patterns, and the pain made patients unable to open their mouths. This is congruent with the findings by Felipak et al. (2020) that pain from untreated dental caries affected eating, mastication, pronunciation and even growth and development.

4.2.2 Level of Tooth Loss Noticed among the Participants

There was noticeable tooth loss among the adult patients surveyed. According to these results, the majority of the patients had lost a tooth or two. The results have shown that most of the dental caries were caused by tooth decay. It is known that tooth decay is a product of poor oral hygiene habits. There is a higher association between adults losing teeth and the age of dental patients. According to Cheng et al. (2018), tooth loss is a result of poor oral health hygiene which dominates the other causes. Therefore, age informs the prevalence where in most cases the older generation has a higher prevalence than the younger generation as

also was noted by Perez et al. (2020). This study established that the loss of a tooth from the dental patients interviewed was attributed to the cavity. This finding was in line with the previous study by Tungare et al. (2021) such that 80.5% of tooth loss was caused by tooth loss.

4.2.3 Level of tooth loss according to jaw n segment
4.2.3.1 Bad breath

The researcher sought to establish the self-esteem and self-regard of the dental caries patients when associating and communicating as well as the odour that comes from bad breath. Socially, the study found that low self-esteem was affecting at least two-thirds of the surveyed dental caries patients. According to the expert opinion of the key informants, it was established in this study that tooth loss negates the self-esteem of the patients. Mouth halitosis (bad breath) affects the self-esteem of the patients where the patients with painful cavities cause them a lot of pain thus making it hard to open the mouth as well as clean it. In this case, Kapoor et al. (2019) revealed that bad breath led to increased low self-esteem among patients with painful dental caries. This has led to dental patients with halitosis suffering from normal activities and poor communication (Miotti et al., 2023).

V. CONCLUSIONS & RECOMMENDATIONS

5.1 Conclusions

Toothache, tooth loss and bad breath are the major social impacts of dental caries that affect the quality of life popularly referred to as oral health-related quality of life. The other effects are sleeping interruption as a result of toothache, diet modification as a result of toothache or tooth loss, low self-esteem as a result of bad breath, tooth loss or poor aesthetics as discoloured teeth due to dental caries. Poor phonetics and poor aesthetic as a result of tooth loss. The social effect is more common.

5.2 Recommendations

From the community-based oral hygiene campaign, the community members should be informed to foster a habit of attending dental clinics occasionally at least once a year for check-ups. Moreover, it would be important for carious patients to seek preventive services to mitigate against teeth loss and bad breath that negatively influence their self-esteem.

REFERENCES

Abbass, M. M. S., AbuBakr, N., Radwan, I. A., Rady, D., El Moshy, S., Ramadan, M., Ahmed, A., & Al Jawaldeh, A. (2019). The potential impact of age, gender, body mass index, socioeconomic status and dietary habits on the prevalence of dental caries among Egyptian adults: a cross-sectional study. *F1000Research, 8*, 243. https://doi.org/10.12688/f1000research.17892.1

Akaji, E. A., Folaranmi, N., & Ashiwaju, O. (2014). Halitosis: a review of the literature on its prevalence, impact and control. *Oral Health Prev Dent*, *12*(4), 297-304.

Alsubaie, A. S. R. (2019). Oral health-related behaviours and dental pain among children in Saudi Arabia. *Journal of International Oral Health*, *11*(1), 1-4.

Andegiorgish, A. K., Weldemariam, B. W., Kifle, M. M., Mebrahtu, F. G., Zewde, H. K., Tewelde, M. G., ... & Tsegay, W. K. (2017). Prevalence of dental caries and associated factors among 12-year-old students in Eritrea. *BMC Oral Health*, *17*(1), 1-6.

Bashiru, B. O., & Ovenashia, A. G. (2019). Prevalence, Causes and Pattern of Tooth Loss among Elderly People in Port Harcourt, Nigeria. *Central African Journal of Public Health*, *5*(2), 98-101.

Birungi, N., Fadnes, L. T., Engebretsen, I. M., Lie, S. A., Tumwine, J. K., Åstrøm, A. N., & ANRS 12174 and 12341 Study Groups. (2020). Caries experience and oral health-related quality of life in a cohort of Ugandan HIV-1 exposed uninfected children compared with a matched cohort of HIV unexposed uninfected children. *BMC Public Health*, *20(3)*, 1-12.

Braimoh, O., & Alade, G. (2019). Oral health-related quality of life and associated factors of elderly population in Port Harcourt, Nigeria. *Saudi J Oral Sci*, *6*(1), 10-24.

Cheng, Y. H., Liao, Y., Chen, D. Y., Wang, Y., & Wu, Y. (2019). Prevalence of dental caries and its association with body mass index among school-age children in Shenzhen, China. *BMC Oral Health*, *19(3)*, 1-9.

Cochran, W. G. (1977). *Sampling techniques*. John Wiley & Sons.

Currie, C. (2022). *Investigating Problem-Orientated Patient Pathways, Toothache to Treatment: ImPacT Study* (Doctoral dissertation, Newcastle University).

Da Fonseca, M. A., & Avenetti, D. (2017). Social determinants of pediatric oral health. *Dental Clinics*, *61*(3), 519-532.

Damayanti, M. M., Yuniarti, Y., Caecielia, M., & Irasanti, S. N. (2022). The Effects of Oral Prophylaxis on Sensitive Teeth, Teeth Staining, and Bad Breath. *KnE Life Sciences*, 12-20.

Echeverria, M. S., Schuch, H. S., Cenci, M. S., Motta, J. V. S., Bertoldi, A. D., Hallal, P. C., & Demarco, F. F. (2022). Trajectories of sugar consumption and dental caries in early childhood. *Journal of Dental Research*, *101*(6), 724-730.

Elidrissi, S. M., & Naidoo, S. (2016). Prevalence of dental caries and toothbrushing habits among preschool children in Khartoum State, Sudan. *International Dental Journal*, *66*(4), 215-220.

Felipak, P. K., Menoncin, B. L. V., Reyes, M. R. T., Costa, L. R., de Souza, J. F., & Menezes, J. V. N. B. (2020). Determinants of parental report of dental pain and discomfort in preschool children—The Dental Discomfort Questionnaire. *International Journal of Paediatric Dentistry*, *30*(4), 436-444.

Gao, S. S., Zhang, S., Mei, M. L., Lo, E. C. M., & Chu, C. H. (2016). Caries remineralisation and arresting effect in children by professionally applied fluoride treatment–a systematic review. *BMC Oral Health*, *16*(1), 1-9.

Gil-Montoya, J. A., Sánchez-Lara, I., Carnero-Pardo, C., Fornieles-Rubio, F., Montes, J., Barrios, R., ... & Bravo, M. (2017). Oral hygiene in the elderly with different degrees of cognitive impairment and dementia. *Journal of the American Geriatrics Society*, *65*(3), 642-647.

GoK (2015). Kenya National Oral Health Survey Report 2015. Ministry of Health.

Gomes, C., Monalisa, & Perazzo, M., & Neves, É., & Siqueira, M., & Costa, E., & Protasio, A., & Silva, A., & Botelho, K., & Granville-Garcia, A. (2018). Evaluation of determinant factors for the presence and activity of dental caries in five-year-old children: study with decision tree. *Journal of Public Health, 26*(5), 1-8. https://doi.org/10.1007/s10389-017-0892-2.

Grieshaber, A., Haschemi, A. A., Waltimo, T., Bornstein, M. M., & Kulik, E. M. (2022). Caries status of first-born child is a predictor for caries experience in younger siblings. *Clinical Oral Investigations*, *26*(1), 325-331.

Guedes, C. C., Bussadori, S. K., Weber, R., Motta, L. J., da Mota, A. C. C., & Amancio, O. M. S. (2019). Halitosis: prevalence and association with oral etiological factors in children and adolescents. *Journal of Breath Research*, *13*(2), 567-572.

Haag, D. G., Peres, K. G., Balasubramanian, M., & Brennan, D. S. (2017). Oral conditions and health-related quality of life: a systematic review. *Journal of dental research*, *96*(8), 864-874.

Ismail, A. I., Lim, S., & Tellez, M. (2015). Tooth surface level caries progression in the primary dentition among preschool children. *Caries Research*, *49*(4), 442-448.

Kapoor, V., Gupta, A., & Arya, V. (2019). Behavioural changes after motivational interviewing versus traditional dental health education in parents of children with high caries risk: Results of a 1-year study. *Journal of Indian Society of Pedodontics and Preventive Dentistry*, *37*(2), 192-197.

Kassebaum, N. J., Smith, A. G. C., Bernabé, E., Fleming, T. D., Reynolds, A. E., Vos, T., Murray, C. J. L., Marcenes, W., & GBD 2015 Oral Health Collaborators (2017). Global, Regional, and National Prevalence, Incidence, and Disability-Adjusted Life Years for Oral Conditions for 195 Countries, 1990-2015: A Systematic Analysis for the Global Burden of Diseases, Injuries, and Risk Factors. *Journal of dental research*, *96*(4), 380–387. https://doi.org/10.1177/0022034517693566

Kim, H. N., Han, D. H., Jun, E. J., Kim, S. Y., Jeong, S. H., & Kim, J. B. (2016). The decline in dental caries among Korean children aged 8 and 12 years from 2000 to 2012 focused on SiC Index and DMFT. *BMC oral health*, *16*(1), 1-9.\

Miotti, L. L., Vissotto, C., De Nardin, L., de Andrades Manjabosco, B., Tuchtenhagen, S., Münchow, E. A., & Emmanuelli, B. (2023). Does the liner material influence pulpal vitality in deep carious cavities submitted to selective caries removal? A network meta-analysis review. *Clinical Oral Investigations*, *6*(2), 1-14.

Nazir, M. A., Almas, K., & Majeed, M. I. (2017). The prevalence of halitosis (oral malodor) and associated factors among dental students and interns, Lahore, Pakistan. *European journal of dentistry*, *11*(04), 480-485.

Ndagire, B., Mayanja-Kizza, H., Ssenyonga, R., & Nakanjako, D. (2020). Comparative Study of Saliva Flow Rate, pH and Buffer Capacity in Caries-Free and Caries-Active Ugandan Adolescent Students. *Int J Dent Med Sci Res (IJDMSR)*, *4*(1), 29-35.

Nomura, Y., Otsuka, R., Wint, W. Y., Okada, A., Hasegawa, R., & Hanada, N. (2020). Tooth-level analysis of dental caries in primary dentition in Myanmar children. *International Journal of Environmental Research and Public Health*, *17*(20), 76-80.

Otto, M. (2017). *Teeth: The story of beauty, inequality, and the struggle for oral health in America*. The New Press.

Page, P., Steer, T., Bates, B., Cox, L. J., Nicolson, S., Prentice, A., & Swan, G. (2016). National Diet and Nutrition Survey results from years 5 and 6 (combined) of the Rolling Programme (2012/2013–2013/2014).

Paiva, S. M., Abreu-Placeres, N., Camacho, M. E. I., Frias, A. C., Tello, G., Perazzo, M. F., & Pucca-Junior, G. A. (2021). Dental caries experience and its impact on quality of life in Latin American and Caribbean countries. *Brazilian oral research*, *35-57*.

Pakpour, A. H., Lin, C. Y., Kumar, S., Fridlund, B., & Jansson, H. (2018). Predictors of oral health-related quality of life in Iranian adolescents: A prospective study. *Journal of Investigative and Clinical Dentistry*, *9*(1), 154-157.

Panicker, K., Devi, R., Honibald, E. N., & Prasad, A. K. (2015). Oral malodor: a review. *Journal of Indian Academy of Dental Specialist Researchers*, *2*(2), 49-54.

Perez, A. G., Perez, N. G. P., Rojas, A. I. F., Ortega, C. C. B., Pineda, A. E. G. A., & Gutierrez, T. V. (2020). Marginalization and fluorosis its relationship with dental caries in rural children in Mexico: A cross-sectional study. *Community Dent. Health*, *37(2)*, 216-222.

Ribeiro, C. G., Cascaes, A. M., Silva, A. E. R., Seerig, L. M., Nascimento, G. G., & Demarco, F. F. (2016). Edentulism, severe tooth loss and lack of functional dentition in elders: a study in Southern Brazil. *Brazilian Dental Journal*, *27*, 345-352.

Santos, G. M., Pacheco, R. L., Bussadori, S. K., Santos, E. M., Riera, R., de Oliveira Cruz Latorraca, C., Mota, P., Benavent Caldas Bellotto, E. F., & Martimbianco, A. L. C. (2020). Effectiveness and Safety of Ozone Therapy in Dental Caries Treatment: Systematic Review and Meta-analysis. *The Journal of Evidence-Based Dental Practice, 20*(4), 101472. https://doi.org/10.1016/j.jebdp.2020.101472

Schmalz, G., Patschan, S., Patschan, D., & Ziebolz, D. (2020). Oral-health-related quality of life in adult patients with rheumatic diseases—a systematic review. *Journal of Clinical Medicine*, *9*(4), 1172-1173.

Sedky, N. A. (2017). Assessment of oral and dental health status in children with cerebral palsy: An exploratory study. *Journal of Contemporary Dentistry*, *7*(1), 1-11.

Silva Junior, M. F., Batista, M. J., & de Sousa, M. D. L. R. (2019). Risk factors for tooth loss in adults: A population-based prospective cohort study. *PLoS One*, *14*(7), e0219240.

Tungare, S., Shirodkar, G., Oswal, K., Haris, C., & Dhoble, A. (2021). Prevalence of smokeless tobacco use and oral pre-malignant lesions among heavy load truck drivers and general male population in Mumbai, India. *JIDA: Journal of Indian Dental Association*, *15*(11), 47-51.

Wang, Y., Wang, S., Wu, C., Chen, X., Duan, Z., Xu, Q., Jiang, W., Xu, L., Wang, T., Su, L., Wang, Y., Chen, Y., Zhang, J., Huang, Y., Tong, S., Zhou, C., Deng, S., & Qin, N. (2019). Oral Microbiome Alterations Associated with Early Childhood Caries Highlight the Importance of Carbohydrate Metabolic Activities. *mSystems*, *4*(6), e00450-19.

Watt, R. G., Daly, B., Allison, P., Macpherson, L. M. D., Venturelli, R., Listl, S., Weyant, R. J., Mathur, M. R., Guarnizo-Herreño, C. C., Celeste, R. K., Peres, M. A., Kearns, C., & Benzian, H. (2019). Ending the neglect of global oral health: time for radical action. Lancet (London, England), 394(10194), 261–272. https://doi.org/10.1016/S0140-6736(19)31133-X

WHO (2015). Basic Oral Health Survey Methods 5th edition. Accessed on 12/02/2014< www.icd.org/content/publications/WHO-Oral-HealthSurveys-Basic-Methods-5th-Edition-2013.pdf>

WHO (2017). Sugars and dental caries. World Health Organisation. November 2017. https://www.who.int/news-room/fact-sheets/detail/sugars-and-dental-caries#:~:text=Dental%20caries%20is%20an%20expensive,in%20some%20high%2Dincome%20countries.

WHO (2019). *Oral health surveys: basic methods*. World Health Organization.

Zewdu, T., Abu, D., Agajie, M., & Sahilu, T. (2021). Dental caries and associated factors in Ethiopia: systematic review and meta-analysis. *Environmental Health and Preventive Medicine*, *26*(1), 1-11.