ASSESSMENT OF ORAL HEALTH STATUS AND TREATMENT NEEDS AMONG TRANSGENDERS OF BELAGAVI DISTRICT, KARNATAKA: A CROSS-SECTIONAL STUDY.

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LIST OF ABBREVIATION

Sl. No.	Abbreviation	Expanded form
1.	WHO	World Health Organisation
2.	LGBTQ	Lesbian, gay, bisexual, transgender, and queer
3.	DMFT	Decayed-Missing-Filled-Teeth
4.	DT	Decayed Teeth
5.	MT	Missing Teeth
6.	FT	Filled Teeth
7.	BOP	Bleeding on Probing
8.	PPD	Periodontal Pocket Depth
9.	LOA	Loss of Attachment
10.	HIV	Human Immunodeficiency Virus
11.	PPI	Personal Protective Items
12.	OSMF	Oral Sub-mucous Fibrosis
13.	OHP	Oral Hygiene Practices

ABSTRACT

BACKGROUND: Transgender community in India continue to be among the most marginalized and ignored communities, suffering enormous social and economic inequalities. They frequently find themselves with tremendous challenges in receiving dental care, most notably as a result of the fear of discrimination, and so these individuals not easily reveal their identity in terms of gender. This invisibility in the health system scares them off from pursuing vital dental care, hence enhancing their vulnerability to oral disease.

AIM: Assessment of oral health status and treatment needs among transgenders of Belagavi district, Karnataka

METHOD: This cross sectional study conducted over 6 months from December 2023 to May 2024, following the STROBE guidelines. The study included transgender participants in Belagavi district, Karnataka. A total of 600 transgender individuals recruited according to eligibility criteria Data Collection was done using WHO - Oral health proforma (1997) for oral examination. The single examiner underwent extensive training and calibration to maintain consistency throughout the study. Detailed protocols were followed for infection control, examination area setup, and recording. Statistical Analysis for this study includes descriptive statistics, for qualitative data Chi-Square test and for quantitative data non-parametric test Kruskal Wallis was used. Sperman correlation was carried out to between the variables and significance level was kept to be at $p < 0.05$.

RESULTS: The overall caries prevalence among transgender population of Belagavi district was identified as 89.0%. The mean DMFT score was significantly high at 9.61 ± 6.08. The prevalence of periodontal disease was also significant (76.8%),

which consisted of bleeding on probing (75.0%), loss of attachment (74.2%), and periodontal probing depth (62.8%). Oral hygiene habits were not good, and the tobacco usage prevalence identified to be 63.5%. Mouth mucosal ulcers were present in a minority (18.7%), headed by oral submucous fibrosis (8.2%) and followed by leukoplakia (4.3%). Overall, the study highlights a high prevalence of oral health inequalities among Belagavi district transgender individuals and calls for an intervention to the extent that could help reduce disparities.

CONCLUSION: The study revealed a notable prevalence of dental caries, periodontal issues, and poor oral hygiene practices. The use of tobacco accounted for a moderate prevalence in oral lesions like oral submucous fibrosis followed by leukoplakia. The average DMFT score was significantly high, and the majority of the participants needed preventive or routine dental treatment, while others needed emergency treatment. These results indicate considerable oral health inequalities among this marginalized population. There is a pressing need for targeted oral health education, prevention, and additional longitudinal research.

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INTRODUCTION

"Every person deserves access to quality healthcare, free from discrimination." - Ban Ki-moon

Gender exists on a spectrum that differentiates masculinity and femininity, shaped by the interaction of biological sex, societal structures, and personal gender identity. A mismatch between one's gender identity and the sex designated at birth, they are recognized as transgender.[1] Transgender and gender nonconforming individuals form a unique yet diverse group within the LGBTQ (lesbian, gay, bisexual, transgender, and queer) community. Their identity is defined by their gender rather than their sexual orientation, distinguishing them from the sex assigned at birth.[2,3]

In India, a "blessing" from transgender individuals is often regarded as more desirable than a "curse".[1,4] Perhaps transgender individuals were of various social, religious, and cultural backgrounds still, when those individuals joined the transgender community, they would sometimes embrace shared religious practices, rituals, and cultural traditions.[5] After years of advocacy and struggle, the LGBTQ community gained legal recognition when the third gender category was officially incorporated into the Indian constitution on April 15, 2014.4 Even with such legal recognition, they are still subjected to marginalization because of deep social prejudices and cultural pressures.[6] According to the 2011 Census of India, about 487,803 persons identified as transgender.[7] However, this figure is widely perceived as an underreport due to societal stigma and reluctance among many transgender individuals to divulge their identity. Different organizations believe that the actual transgender population could be between 5 and 6 million in India. This gross disparity

affirms yet again the difficulty in assessing this transgender community in the country.[8]

A landmark study by the National Center for Transgender Equality and the National Gay and Lesbian Task Force revealed the significant discrimination experienced by transgender individuals. This Research has indicated that 63% of transgender individuals have faced serious experiences of discrimination, which severely affected their quality of life as well as their ability to earn a living or to be emotionally stable. Such experiences include job loss, eviction, bullying and/or harassment in schools that lead to dropping out; bullying by teachers; sexual and physical assault; homelessness due to one's gender identity; loss of romantic or parental ties; denial of health care services access; and being incarcerated because of one's gender identity. Each of these experiences had devastating, long-term consequences on an individual's mental, emotional, and financial well-being.[9]

The above reasons, including persistent gender discrimination, social stigma, and lack of access to education, employment, and housing, contribute to significantly higher suicide rates among transgender population compared to that of general population. In India, approximately 31% have attempted suicide, with nearly half doing so before the age of 20. In Karnataka alone, an estimated 40–50 transgender individuals die by suicide each year, although exact figures remain undocumented.[6] Forced into marginalized livelihoods such as begging or sex work, their mental and emotional well-being deteriorates further.[10] Factors like HIV status, lack of social support, and exposure to violence exacerbate the situation, emphasizing the urgent need for focused research and intervention.[11]

Transgender individuals in India remain one of the most neglected and marginalized communities, facing significant social and economic disparities. Limited acceptance from family and peers, societal discrimination, restricted access to education, and a lack of livelihood opportunities further worsen their struggles.[12] Such challenges can spread to health-related matters where they usually meet bias and insensitivity, putting them in an environment where there is greater risk of falling into addictive behavior with tobacco, alcohol, and substance abuse that would adversely affect both systemic and oral health. Moreover, their peers may influence them into unsafe oral harmful practices that further condemn their well-being.[13]

Maintaining good oral health, which is essential to overall health, depends largely on habits such as consistent tooth brushing, flossing, and routine dental checkups.[14] However, transgender individuals often face significant barriers in accessing dental care, as the fear of discrimination makes it difficult for them to disclose their gender identity.[14,15] This sense of invisibility within the healthcare system discourages them from seeking essential dental services, increasing their risk of oral diseases. The situation is further exacerbated by India's reliance on the private sector for oral healthcare, with no comprehensive national oral health policy in place. India's last comprehensive national oral health survey was carried out in 2002, underscoring the pressing need for more current and relevant data. Furthermore, there is a significant gap in research concerning the oral health of transgender individuals in the country, with existing literature being scarce and insufficient. Additionally, cultural insensitivity and stigma further hinder their access to dental care. A study conducted in South India revealed that dental students showed the least regard for LGBT individuals compared to those with intellectual disabilities, mental illness, and drug abuse, reflecting deep-seated biases within the healthcare sector.[16]

In response to this research gap, the present study seeks to evaluate the oral health status and treatment requirements of transgender individuals residing in the Belagavi district. The findings will provide valuable insights to inform targeted oral health policies and interventions. The novelty of this cross-sectional study lies in its potential to enhance understanding of oral health within this marginalized community.

AIMS AND OBJECTIVES

AIM OF THE STUDY:

Assessment of oral health status and treatment needs among transgenders of Belagavi district, Karnataka

OBJECTIVES OF THE STUDY:

- To assess the oral health status among transgenders of Belagavi district, Karnataka.
- To assess the dental treatment needs among transgenders of Belagavi district, Karnataka.

REVIEW OF LITERATURE

1. This systematic review carried out by Kumar V et. al., (2025) emphasizes the fact that transgender people have substantial interpersonal, social, and systemic barriers to oral health. Poor oral health in this group is due to a lack of awareness and access to trans-competent, low-cost dental care. 20 relevant studies were included after screening 2026 articles based on a comprehensive search and appraisal process. Stigma, discrimination, and socio-economic factors harm transgender oral health. The review urges urgent policy changes to improve access and outcomes.[17]

2. The review by Fakhrjahani I et al., (2024) found only 10 studies on oral health outcomes and care use among 2SLGBTQ+ populations, noting a substantial gap in the literature. Five studies were from India, four from the U.S., and one from Brazil. Few highlighted poorer oral health in transgender individuals, while two reported similar dental service use. Important barriers included lack of financial resources, poverty, and experienced discrimination, like being misgendered in health care settings. The overall evidence supports more favorable oral health status in 2SLGBTQ+ communities and emphasizes the requirement for more inclusive, representative research to identify these disparities completely.[18]

3. The systematic review by Mehta V et al., (2024) that included 12 studies with 1,566 transgender participants in India showed marked disparities in oral health across the population. The overall prevalence of toothbrush usage was 83%, while tobacco use behavior was prevalent with 12% smoking and 53% consuming smokeless tobacco. Prevalent oral health conditions were dental caries (78%), calculus (65%), and gingival bleeding (18%). These results indicate a significant oral health burden among transgender people, prompted by unhygienic practices and prevalence of

tobacco usage. The research emphasizes the necessity for the implementation of comprehensive and directed dental health programs aimed at enhanced oral health among this disadvantaged population.[19]

4. The research carried out by Sneha G et al., (2023) on 120 transgender people in Western Maharashtra sought to check their dental findings . The study participants demonstrated diverse educational levels, of whom a significant percentage had no formal education. Oral hygiene practices were suboptimal—85.83% used toothpaste and a toothbrush, use of mishri (52.50%), fingers and tooth powder (17.50%), and no brushing in 14.17% indicated poor oral hygiene behaviors. The use of tobacco, both smoked (14.17%) and smokeless (21.67%), and use of mishri (35.83%) added to oral health risks. Clinical examination showed periodontal problems, as indicated by probing pocket depth and clinical attachment levels. The research points out a significant necessity for awareness and specific oral health interventions among the transgender population of Western Maharashtra in order to bridge the care gap and enhance general oral health outcomes.[20]

5. Suleman M et.al., (2023) study among 149 transgender people of Lahore City to evaluate the dental findings and oral hygiene behavior. By utilizing a validated questionnaire and clinical checkup, it was revealed by the study that mean DMFT 6.86. Mean decayed teeth were 3.4, missing teeth were 2.94, and filled teeth were 0.52.[21]

6. The research by Kumar G et.al., (2022) a study among 153 HIV-positive transgender persons in Odisha and reported generally poor oral health conditions. The majority of the participants were unemployed and had low formal education. Although the majority used toothbrushes, oral hygiene habits were poor, with toothpicks being the most frequently used interdental cleaning aid and no floss or

interdental brush usage. The average DMFT value was 1.424, with 28.1% presenting with periodontal pockets (4–5 mm) and 37.25% presenting with loss of attachment (6–8 mm). Fluorosis was also present, with 20.91% presenting with very mild and 18.95% presenting with moderate fluorosis. There were significant correlations between age and loss of attachment, occupation and DMFT, and education level and CPI scores. These results emphasize the compelling necessity for HIV-positive transgender oral health interventions that are targeted at the Odisha population.[22]

7. Sathyanarayanan et.al., (2022) a study regarding oral habits in transgender community in Puducherry, India, sought to evaluate their oral health habits with the help of a close-ended questionnaire. Snowball sampling was used to gather data regarding education, oral hygiene habits, harmful habits (tobacco, alcohol), dental check-ups, and consumption of sugar. Findings indicated that although more than 72% had more than high school education and 86.1% brushed teeth, 47% had never been to a dentist, and over half had no oral care. Also, 61% used tobacco, most had high sugar intake, and over 55% drank alcohol on a daily basis. The research concludes that more effort is required to increase oral health awareness and enhance dental habits in this underprivileged group.[23]

8. This cross-sectional study by Shanmugam M et.al., (2022) evaluated the oral hygiene measures and lifestyle habits of 250 transgender people living in Tamil Nadu. The results indicated that 81% consumed tobacco, and most adhered to a non-vegetarian dietary practice. Although 89% practiced oral hygiene using a toothbrush, 75% experienced dental issues, with the most frequent visits to a dental clinic—both government and private being equally divided—being for the purpose of filling teeth. Lifestyle habits had a strong focus on looks, with regular use of cosmetics and 74%

indicating regular cleaning of teeth to improve their smile, which they cared more about than speech because of voice changes.[24]

9. This descriptive cross-sectional survey conducted by Muhammad M et.al., (2022) was undertaken to evaluate oral hygiene awareness in 73 transgender persons living in the twin cities of Islamabad and Rawalpindi, Pakistan. While most participants showed awareness of basic oral hygiene measures, toothpaste use was reported by only 26%, and 70% of them avoided adjunctive other dental aids. A noteworthy 98.7% of the participants reported using betel nut, pan, or tobacco—behaviors that are well-documented to have harmful oral health. No statistically relationship was found with awareness of oral hygiene and the age or city of residence of the participants. These results identify a wide awareness-practice gap among the transgender community in Pakistan.[25]

10. The study by Manpreet et al., (2021) revealed that transgender adults had worse oral and periodontal health than the control group, with increased intra-oral lesions like oral nicotine stomatitis (27.5%) and leukoplakia (20%). Moreover, 27.5% of the transgender subjects were HIV seropositive. The density of Candida colonies was considerably greater in the transgender group ($p = 0.014$), reflecting increased susceptibility to fungal infections. These findings suggest that these individuals may face a heightened risk of oral health issues, potentially due to a higher incidence of tobacco and alcohol consumption. The study calls for longitudinal studies to investigate oral health barriers in the transgender population and to formulate targeted preventive and management plans.[2]

11. The pilot survey by Kumbhalwar A et al., (2021) among 49 transgenders in Pune city indicated high oral health issues and unmet clinical needs. High use of smokeless tobacco (57.1%) was noted, and just 30.6% reported giving up tobacco. Clinically,

91.83% showed deposits of calculus, 89.7% had a history of dental caries in permanent teeth, and 87.7% had untreated caries lesions. More than half the subjects (55.1%) had a score of four or more on the DMFT. Treatment needs were largely one-surface fillings (indicated in 40 subjects) and pulp treatment (indicated in 16). The study highlights the extent to which lack of awareness about oral health and destructive habits like smoking contribute to the oral health of trans persons.[26]

12. This research by Prates SG et.al., (2021) was to investigate dental service utilization, self-perception, and effect of oral health on everyday activities among transgenders using a controlled cross-sectional design to compare 45 transgender and 45 cisgender participants. Although the groups shared similar access to dental care, transgender members were more likely to feel anxious (3.8 times) and embarrassed (5 times) about their teeth. These results point out that, in addition to curing disease, dental care of transgender patients must also handle looks and psychological effects to provide truly full and inclusive oral health care.[27]

13. This cross-sectional survey conducted by Kumar G et.al., (2021) evaluated oral hygiene-related knowledge, attitudes, and practices in 205 transgender people living in Bhubaneswar during the COVID-19 pandemic. It found that a greater number among rural population were unaware of their oral health status compared to urban participants who were likely to report good oral health. Statistical differences between urban and rural groups were seen in brushing frequency, time of brushing, brushing materials and equipment, and measures used to control bad breath.[28]

14. The study by Marlecha R et.al., 2020 found general dental status of transgender people in Chennai was poor, with over half having untreated dental caries. The mean DMFT scores were 1.89 ± 1.773, 0.83 ± 2.664, and 0.15 ± 0.522, respectively. A large percentage (more than 60%) had never gone to a dentist, and 30% thought

dental visits were only necessary when in pain. The major obstacles to dental care were high costs of treatment (15.7%) and dental fear (22.9%). Also, 77.1% lacked dental awareness camps, and 54.3% felt ignored in receiving oral health care. A vast majority (91.4%) called upon the government to introduce special dental health schemes.[29]

15. This descriptive study by Mohd FN et.al., (2020) evaluated oral health related quality of life of 100 transgender (TGW) in Malaysia with the Malay short version of the OHIP-14 questionnaire. The results showed a mean OHIP score of 16.67 ± 10.39, which reflects worse OHRQOL than the general population and similar to those living with HIV/AIDS. Even after assessing sociodemographic information, experiences of discrimination, and oral hygiene habits, no statistically significant correlations were established with OHRQOL. The findings highlight that oral health has a considerable impact on their life, highlighting the necessity for targeted interventions for their oral health improvement.[30]

16. Kalyan P et al., (2020) study on eunuchs in Central Gujarat to evaluated the periodontal status among eunuchs and its correlation with demographic variables. With the WHO Oral Health proforma (2013), The mean periodontal pocket depth was 3.12 ± 0.89, and CAL was 2.88 ± 0.74. No significant difference were found by age or level of education. Poor periodontal health was identified in the sample, highlighting the requirement for inclusive dental services and purposeful oral health interventions.[31]

17. This cross-sectional work by Adekugbe OC (2020) was planned with an objective to measure annual dental care use and oral health status in LGBTQ individuals of Iowa City. Online or postal questionnaires were completed by 769 participants. Lower income, being transgender, and having problems with accessing dental care which

significantly related to worse oral health. Those who reported being gay, bisexual, lesbian, pansexual, or queer had poorer oral health than those who reported being heterosexual. Better dental visit rates were associated with higher incomes, white race, and being heterosexual, and Medicaid or unmet dental need decreased the probability of recent dental visits.[32]

18. This qualitative study conducted by Macdonald DW et.al., (2019) investigated the interactions of 36 transgender and gender nonconforming (TGNC) young people (ages 14–24) with oral health care providers. Participants, recruited from a Transgender Health Clinic, typically had positive experiences, with any difficulties being addressed in a timely manner. Insurance processing presented some difficulty. Gender identity-related anxiety and stress were noted but could be mitigated by minor changes in clinic settings, including affirming intake forms and affirming office design. The research identifies that although TGNC youth may not need identity-specific dental care, creating a safe and affirming dental environment greatly improves their overall dental care experience.[3]

19. The research by Muralidharan S et al., (2018) in Pune on 270 participants, including homosexuals and transgender, evaluated dentition status, and their effect on oral health related quality of living. While statistically no significant differences were established between the total quality of life domains, a significant relation was observed among DMFT scores and the seven domains of life quality. Oral caries, natural tooth structure loss, and restorative care had a significant cumulative effect on participants' perceived oral health well being. The study underscored a necessity for tailored oral health measures that are tailor-made for MSM and transgender individuals.[33]

20. This cross-sectional survey conducted by Samuel SR et.al., (2018) of 212 transgenders in South India reported poor oral health, high tobacco use, a mean probing pocket depth of 4.2 mm, and DMFT score of 3.67. Majority of the study subjects were dependent on begging, resided in slums, and had a negative perception of oral health. The study also demonstrated considerable stigma among dental residents with decreased acceptance to treat transgenders, particularly those with HIV or an unknown status.[34]

21. Heima M et.al., (2017) designed to assess dental fear among transgender people and determine its predictors using an anonymous web-based and paper survey with the Dental Fear Survey (DFS) in a study. Although no appreciable differences in dental fear scores with regard to sex assigned at birth or gender identity were observed, regression analysis identified fear and history of discrimination or maltreatment as significant predictors of dental fear. These results highlight the importance of developing safe, non-discriminatory dental care environments that will reduce anxiety and enhance accessibility of care to transgender individuals.[35]

22. This narrative review conducted by Menon I et.al. 2014 discusses the oral conditions demands and unmet dental treatment in the transgender group, based on systematic searching of databases such as PubMed, Cochrane, Embase, and Google Scholar. Out of 20 short-listed studies, there was a high incidence of oromucosal lesions like Oral Submucous Fibrosis, leukoplakia, and lichen planus, which may be related to widespread gutkha consumption. Poor knowledge about oral hygiene and also low use of dental care services were observed.[36]

23. The research by Arjun TN et.al., (2014) evaluated the periodontal condition of eunuchs in Bhopal, Madhya Pradesh, with the help of the WHO (1997). Self-reported eunuchs were surveyed and control group was compared who belonging to the same

localities. A prevalence of gingival and periodontal problems was found to be very high, with bleeding gums, shallow and deep pockets, and loss of attachment being higher among the eunuchs. The results underscore the necessity for directed oral hygiene education and rudimentary dental care in order to enhance their periodontal health.[37]

24. This cross-sectional study by Hongal S et.al., (2014) assessed dental prosthetic status and requirements in eunuchs living in Bhopal, Madhya Pradesh, with the matched control population of the general population. Results showed that a minority of subjects had dental prostheses, though slightly less among eunuchs than males. Yet overall need for combination and multi-unit prostheses was significant for all groups. The research points out a major unmet need for prosthetic care among eunuchs, emphasizing the need for improved access to dental rehabilitation services.[38]

25. Saravanan et.al., (2006) evaluated the oral health conditions of eunuchs at Chennai. Out of 137 subjects, 29.2% presented with oral mucosal lesions, and 69.3% presented with dental caries (mean DMFT 2.95). Periodontal conditions were seen in 5.73%, with 16.8% presenting with attachment loss. The needs for treatment were extraction of 50.4% and prosthesis of 37.3%. Interestingly, 34.3% were HIV positive and 35% had habits of gutka, which were the causes of mucosal lesions. Excessive sweet intake (83.2%) may have caused the high caries prevalence.[39]

Study related to general health and discrimination:

26. This research by Şimşek KO et.al., (2024) in Turkey sought to assess the health condition and experience of sexually transmitted infection (STI)-related among unregistered transgender sex workers based on phenomenological qualitative study design. Findings showed that transgender sex workers experience many chronic

diseases like asthma, COPD etc., but major concerns included STIs, psychological disorders, and suicidal ideation. The respondents had challenges in seeking healthcare, usually caught between public and private hospitals, with the hindrances of no social security coverage, limited finances, insufficient information, and feeling underappreciated.[40]

27. The research performed by Cantwell EG et.al., (2020) captures the medical issues of transgender persons, especially in oral health. Dread of discrimination and restricted access to care can result in the avoidance of dental needs. The research examined the potential relationship between hormone replacement therapy (HRT) used during gender change and its influence on oral health. Literature from recent research indicates that sex hormones may influence periodontal tissues, and hence there might be a correlation in transgender individuals on HRT.[41]

28. The review conducted by Virupaksha HG et al., (2016) examines the elevated suicide rate and suicidal behavior among transgender people, with key contributing factors including gender-based victimization, discrimination, bullying, rejection by family and society, and abuse by partners, police, and the healthcare system. Attempted suicide rates among transgender individuals vary between 32% and 50% worldwide. In spite of these issues, the community shows high resilience. The research calls for culturally appropriate, transgender-specific suicide prevention methods that target bolstering protective and resilience factors.[42]

29. The research by Nazargan M et.al., (2012) investigated the relationship between Depression, sexual partner violence, and perceived discrimination among low-income Latina transgender women in Los Angeles. 220 participants were interviewed with a structured questionnaire. More than one-third had severe depressive symptoms, and many had experienced frequent discrimination and a history of partner violence. A

robust association was found between perceived discrimination and depression severity, highlighting the necessity of further research on mental health vulnerabilities in this population.[43]

30. The Grant JM et.al., (2011) survey emphasizes the widespread and frequently underreported discrimination against transgender people in virtually every sphere of life from homes and schools to workplaces, health care facilities, and encounters with law enforcement. It is conducted by the National Center for Transgender Equality and the National Gay and Lesbian Task Force, and it echoes the words of thousands of individuals who courageously spoke up and shared their stories from throughout all U.S. states and territories and from D.C. Their involvement has yielded an unparalleled portrait of injustice. The data are a formidable instrument for advocates, activists, and policymakers to use in seeking justice and equal treatment for this community.[9]

31. The survey by Grant JM et.al., (2010) of 6000 transgender people in united states had serious obstacles to accessing healthcare, with a large number delaying cares because of discrimination or lack of funds. Almost one in five were denied treatment according to their gender identity, and others were harassed or physically assaulted in medical environments. Half indicated that they needed to teach their providers about transgender care, and discrimination was more probable when providers were aware of their transgender status. The community also had a higher rate of HIV and substance abuse as a means of coping with discrimination. Alarming is the fact that 41% reported having tried suicide well above the general population indicating the need for supportive and inclusive healthcare settings.[44]

32. This narrative review done by Tamrat J et.al., (2010) reviews current studies to provide transgender experience and their oral health needs. 35 articles from databases. The themes noted included psychosocial oral health concerns, care barriers, provider cultural competency, and welcoming dental approaches. The transgender population is confronted with considerable oral health disparities based on systematic discrimination and limited access. Enhancing provider sensitivity and promoting inclusivity are critical first steps toward the realization of equal oral health outcomes for this oppressed group.[45]

33. The study by Rehan N et.al., (2009) was intended to determine risk behaviors, sexual behaviors, and STI and HIV/AIDS awareness among hijras in Lahore. Two hundred participants were enlisted and interviewed. The majority of them were illiterate, and some were married with children. Many of them reported drug use in the last month, and the majority practiced high-risk sexual behaviors, including frequent unprotected sex with many new and regular clients. Although most participants had heard of HIV/AIDS, their knowledge of transmission was inaccurate[46]

MATERIALS AND METHODS

Study Design, Duration and Setting

The study followed a cross-sectional research design, adhering the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines, and study was carried over a period of December 2023 to May 2024.

Source of data

Participants were transgender individuals in the Belagavi district, Karnataka, India.

Selection Criteria

Inclusion criteria

- Transgender individuals who voluntarily agreed to take part in the study
- Willing transgender participants were included

Exclusion criteria

- Transgender individuals unwilling to voluntarily agreed to take part in the study

Ethical Considerations

The Ethics Committee of the Institution granted permission for the study (Reference number: 190, Date: 16.11.2023). Approval was also obtained from the Transgender Humanity Foundation. Prior to the commencement of the study, written informed consent was obtained from the transgender participants after they were thoroughly informed about the study's purpose and procedures. ANNEXURE I and ANNEXURE II

Sample size calculation

By using the formula:

$$n = \frac{\left(Z_{1-\frac{\alpha}{2}}\right)^2 (pq)}{d^2}$$

Where, $\left(Z_{1-\frac{\alpha}{2}}\right)^2 = 1.96$

p = prevalence (from Parent Article)

q = 1-p

d = Precision

Using it in the aforementioned formula,

p = 72.2 q = 27.8 d = 3.61

Considering attrition as 10 %, the final estimated sample size of **600** was obtained at the end of the study.

Ref: Gadhiraju et al., found dental caries prevalence in Transgenders as 72.2%.[1]

Sampling technique

The transgender participants were selected through convenience sampling technique

Organization of the study

1.Pilot study

35 transgender participants were evaluated to assess the feasibility and identify any potential challenges encountered during the execution of the study.

2. Training and calibration

Before commencement of the study, a single investigator underwent a thorough standardization and calibration process at the Department of Public Health Dentistry, KLE V.K Institute of Dental Sciences, Belagavi, under supervision of a professor to ensure consistent assessments. The investigator then performed clinical examinations on ten subjects using the WHO Oral Health proforma 1997, and all ten participants were later recalled for reassessment. The weighted Kappa coefficient for intra-examiner reliability was found to be 0.88, reflecting a high degree of consistency.

3. Implementation of the survey

a) Scheduling:

The examination schedule for transgender participants was preplanned and communicated to both the participants and the head of the taluk or the location incharge one week in advance. Each day, a maximum of 30 participants underwent examinations and interviews. The examinations took place during daylight hours, specifically from 10 am to 1 pm and from 2 pm to 5 pm, utilizing natural light. The examinations were conducted at a consistent location in the taluk.

A log book was meticulously maintained, keeping a track of the examination done every day with details like the number of participants examined, the location and any other relevant information.

b) Data collection: WHO Oral Health proforma (1997)

This study employed the WHO Oral Health Assessment Form (1997). This structured tool is intended to evaluate an individual's oral health status and treatment needs, offering essential data to support the planning and implementation of

comprehensive oral healthcare programs. Information on dental status was captured using DMFT scores, while periodontal health was assessed by recording Bleeding on Probing (BOP) and measuring Periodontal Pocket Depth (PPD). Additionally, any observed oral mucosal lesions were documented, along with the required dental treatments. Further details on the format can be found in ANNEXURE III.

c) Emergency care and referral:

Participants requiring emergency or additional treatment were appropriately referred to the KLE Vishwanath Katti Institute of Dental Sciences for further assistance.

d) Personnel and organization

1. Recording clerk: Two recording clerks received training to accurately record data using the WHO Oral Health Proforma and for assistance throughout the survey. To ensure smooth coordination and accuracy in data entry, a preliminary session was held, during which the examiner and the recording clerks jointly completed a set of forms prior to the start of the survey. This preparatory step was designed to enhance workflow efficiency and ensure the precision of the collected data.

2. Organizing clerk: The head of the taluk of the transgender community was designated as the organizing clerk to oversee the smooth progression of participants for oral examinations. The head helped maintain an orderly flow of activities

e) Infection control

Strict infection control protocols were implemented throughout the study to ensure the safety of both the participants and the examiners. All examination instruments were sterilized according to standard procedures before each use. To

avoid cross-contamination, the examiner used disposable gloves and masks, replacing them after each participant. The examination area was cleaned and disinfected between sessions to maintain a sterile environment.

Hand hygiene was rigorously practiced, with alcohol-based hand sanitizers and handwashing facilities readily available for both participants and staff. Sterile disposable instruments, where applicable, were used to further reduce the risk of infection.

f) Examination area:

The examinations were conducted at a consistent location within the selected taluk. All essential arrangements were meticulously organized at these sites to ensure smooth operations. This included setting up examination stations, ensuring proper lighting, and maintaining cleanliness and sterility of the area. The location was equipped with the necessary tools and materials to facilitate the examinations, with a clear workflow established to minimize disruptions and ensure the timely progression of participants through the examination process. Additionally, provisions for maintaining infection control standards were strictly adhered to throughout the study.

g) Lighting:

All examinations were carried out under natural daylight to ensure optimal illumination. In cases where additional light was necessary, a torch was utilized.

h) Seating of the recording clerk / intern:

The recording clerk was positioned strategically to ensure clear auditory reception of the codes and a clear view of the examination area. Simultaneously, the

examiner had visibility of the codes being inputted into the form, minimizing the likelihood of recording errors.

i) Instruments and supplies:

An adequate no of instruments was maintained at the site of examination site.

The following instruments were used in the site:

- Disposable mouth masks & gloves
- Disposable Diagnostic instruments
- WHO Probe
- PPI Kit
- Torch
- Korsolex disinfectant solution for cold sterlization
- Gauze & cotton
- Kidney trays
- Auto Clave
- Cloth hand towels
- Torch
- Cotton dispenser
- WHO Oral Health Assessment Form 1997

j) Moral obligation:

As part of the moral obligation of this study, once the oral examinations were completed, the transgender participants received oral health education. This included a demonstration of proper brushing techniques, along with the provision of toothbrushes and toothpaste to encourage better oral hygiene practices. Additionally,

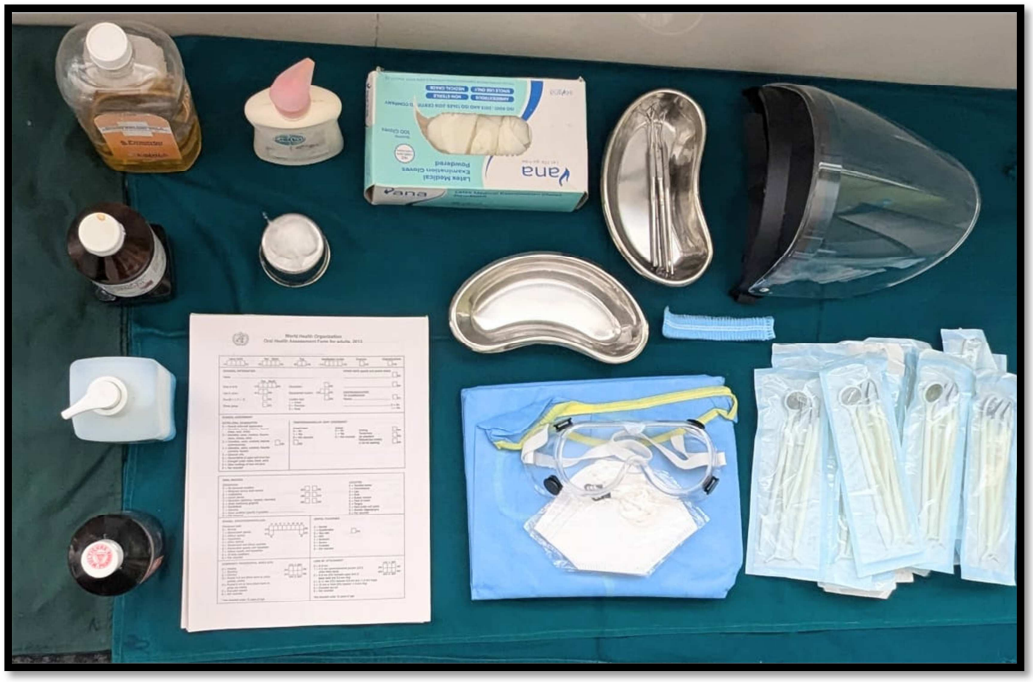
referral cards for necessary dental treatments were provided to participants requiring further care, ensuring they had access to appropriate follow-up services. These measures were undertaken to raise oral health consciousness and support the general well-being of the participants.

Statistical analysis:

The collected data were entered into a spread sheet using Microsoft Excel 2019 by the examiner. Statistical analysis was performed using IBM-SPSS® Statistics Version 25 (USA). Descriptive statistics, including frequencies, means, and standard deviations, were calculated. To enhance clarity, the data were visually represented using graphs and tables for easier interpretation.

The Kolmogorov–Smirnov test was used to evaluate the normality of the data distribution, which revealed that the data did not follow a normal distribution. Consequently, non-parametric tests were applied, including the Chi-square test to compare frequencies between groups. The Kruskal-Wallis test was utilized to assess differences among the groups. To determine the relationship between oral hygiene practices, tobacco use, and dental parameters, Spearman's correlation was conducted. A significance level of $p < 0.05$ was considered for all analyses.

Photographs illustrating the study progression and methodology



Photograph 1: Armamentarium used in the study

Photograph 2: Informed consent form and oral examination done among transgender participants

Photograph 3: Oral examination carried out in one of the sites

Photograph 4: Distribution of tooth brush and paste with referral cards among the transgender participants in one site

Photograph 5: Oral examination carried out in another sites

Photograph 6: Distribution of tooth brush and paste with referral cards among the transgender participants in another site

RESULTS

Demographic characteristics of the transgender participants:

Table 1 summarizes demographic characteristics of transgender participants among different age groups. Among the 600 participants, the majority were between 41–50 years (32.0%), followed by those aged above 50 years (29.7%). Participants aged 31–40 years and 21–30 years comprised 21.5% and 16.8% of the sample, respectively. Mean age of the participants was 44.20 ± 12.59 years [Table 1 and Figure 1].

Table 2 presents the transgender participants distribution based on gender identity. Of the 600 participants, a majority identified as trans women (88.5%), while 11.5% identified as trans men [Table 2 and Figure 2].

Frequency of dental caries in the transgender participants:

Table 3 shows comparison of the mean decayed, missing, and filled teeth components among transgender participants across different age groups. The mean value decayed teeth was highest in participants aged 41–50 years (8.25 ± 5.93), followed by those aged 31–40 years (8.06 ± 4.80), >50 years (7.32 ± 5.38), and 21–30 years (5.25 ± 3.54). Variation in the count of decayed teeth across age groups was statistically significant using the Kruskal-Wallis test ($p < 0.001$) [Table 3 and Figure 3]. The mean value of missing teeth was found to be 0.89 ± 0.90 in the 21–30 years group, 1.36 ± 1.78 in the 31–40 years group, 1.64 ± 2.27 in the 41–50 years group, and 3.26 ± 3.64 in the >50 years group. A significant difference was observed, using the Kruskal-Wallis test.($p < 0.001$) [Table 3 and Figure 4].

The mean value of filled teeth was found to be 0.37 ± 0.58 (21–30 years), 0.21 ± 0.53 (31–40 years), 0.29 ± 0.58 (41–50 years), and 0.18 ± 0.39 (>50 years), with a notable statistical difference identified across the various age groups using Kruskal-Wallis test ($p = 0.014$) [Table 3 and Figure 5].

The DMFT scores were found to be 6.51 ± 3.91 (21–30 years), 9.63 ± 5.03 (31–40 years), 10.17 ± 6.34 (41–50 years), and 10.76 ± 6.89 (>50 years). The differences across age groups were notably significant using Kruskal-Wallis test ($p < 0.001$) [Table 3 , Figure 6]. The overall mean DMFT score among transgender participants was found to be 7.43 ± 5.28 for the decayed component, 1.93 ± 2.67 for the missing component, 0.25 ± 0.52 for the filled component, and 9.61 ± 6.08 for the overall DMFT score [Figure 7].

Table 4 presents the caries distribution in transgender participants across various age groups. Caries was found to be most prevalent in the 31–40 years (96.9%), followed by the 21–30 years (89.1%), >50 years (86.5%), and 41–50 years (85.9%). The proportion of participants without caries was highest in the 41–50 years (14.1%) and lowest in the 31–40 years (3.1%). A meaningful association was observed between age group and caries prevalence. was observed using the Chi-square test ($p = 0.011$) [Table 4] with the overall prevalence of Caries around 89.0% [Figure 8]

Prevalence of periodontal disease among transgender participants:

Table 5 presents the distribution of bleeding on probing (BOP) among transgender participants across various age groups. BOP prevalence found to be increases with age, with the more proportion shown in >50 years (84.8%), followed by 41–50 years (81.8%), the 31–40 years (62.8%), and the 21–30 years (60.4%).

Conversely, the absence of BOP was more common among the younger participants, with 39.6% in the 21–30 years and 37.2% in the 31–40 years , compared to only 18.2% and 15.2% in the 41–50 years and >50 years, respectively. A notable significant relation between age group and bleeding on probing was observed using the Chi-square test ($p < 0.001$) [Table 5]

Table 6 shows the loss of attachment (LOA) distribution among transgender participants across different age groups. The percentage of LOA was increases with age, with the more proportion observed in the >50 years group (84.8%), followed by the 41–50 years group (81.8%), the 31–40 years group (62.0%), and the 21–30 years group (56.4%). A notably significant association between age group and LOA was observed using the Chi-square test ($p < 0.001$) [Table 6].

Table 7 distribution of periodontal probing depth (PPD) among transgender participants across various age groups is shown. The percentage of PPD increased with age, with the highest percentage observed in the 41–50 years group (76.0%), followed by the >50 years (71.9%), the 31–40 years (46.5%), and the 21–30 years (42.6%). A notably significant relationship between age group and periodontal probing depth was found using the Chi-square test ($p < 0.001$) [Table 7].

Table 8 presents periodontal prevalence among transgender participants across different age groups. The periodontal conditions was more in the >50 years (86.5%), followed by 41–50 years (82.3%), the 21–30 years group (36.6%), and the 31–40 years (34.1%). A statistically notable association in age group and periodontal prevalence was observed using the Chi-square test ($p < 0.001$) [Table 8]. The overall prevalence was 75% for BOP, 74.2% for LOP, 62.8% for PPD, and 76.8% for overall periodontal conditions [Figure 8 and 9]

Prevalence of traumatic injury and oral mucosal lesions among transgender participants:

Table 9 presents the distribution of traumatic tooth injury among transgender participants in various age groups. The prevalence of traumatic injury was highest in 31–40 years (14.0%), followed by 41–50 years (9.9%), the >50 years (9.0%), and the 21–30 years (8.9%). However, no statistically significant association was observed between age group and traumatic injury, as determined by Chi-square test ($p = 0.488$), with overall prevalence of 10.3% among transgender participants [Table 9 and Figure 10].

Table 10 presents the distribution of oral mucosal lesions among transgender participants across different age groups. Oral submucous fibrosis was most prevalent in 31–40 years (15.5%), followed by 21–30 years (7.9%), the >50 years (6.2%), and the 41–50 years (5.2%). Lichen planus was most frequently observed in the 41–50 years group (4.7%), followed by the 21–30 years group (4.0%), the >50 years group (2.8%), and the 31–40 years group (2.3%). Leukoplakia was most common in the 41–50 years (5.2%) and >50 years groups (5.6%), with lower prevalence in the 31–40 years (3.1%) and 21–30 years groups (2.0%). Erythroplakia showed low prevalence across all groups, ranging from 1.6% to 2.2%. The highest number of participants without any oral mucosal lesion was found in the 21–30 years group (84.2%), followed by the 41–50 years (83.3%), >50 years (83.1%), and 31–40 years groups (77.5%).

No statistically notable association was found in various age group and presence of oral mucosal lesions ($p = 0.168$), with a overall prevalence of 18.7% among transgender participants [Table 10 and Figure 10].

Table 11 presents the distribution of oral mucosal lesion locations among transgender participants across various age groups. The buccal mucosa was most commonly affected site across all age groups, with the highest in the 31–40 years group (18.6%), followed by 41–50 years group (14.1%), the >50 years group (14.0%), and the 21–30 years group (11.9%). Lesions on the hard/soft palate were seen in small proportions, ranging from 0.5% to 3.0%. Lesions located in the sulci were reported only in the 41–50 years (1.0%) and >50 years (1.1%) groups. Gingival lesions were noted in 1.0% of participants in the 21–30 and 41–50 years groups, 0.8% in the 31–40 years group, and 0.6% in the >50 years group. Tongue lesions were rare, with only one case each in the 31–40 and >50 years groups. The highest proportion of participants without any oral mucosal lesion was found in the 21–30 years group (84.2%), followed by the 41–50 years (83.3%), >50 years (83.1%), and 31–40 years groups (77.5%). No statistically significant association was observed between age group and lesion location ($p = 0.682$) . Table 12 and 13 shows overall distribution of dental parameters among transgender participants [Table 12 and 13].

Prevalence of tobacco usage among transgender participants:

Table 14 presents the distribution of tobacco and non-tobacco users among transgender participants. Among the 600 participants, 374 (62.3%) were found to be smokeless tobacco users. The most commonly used smokeless product was areca nut (33.2%), followed by gutkha (13.2%), toombak or snuff (9.8%), and other forms (6.2%). A total of 226 participants (37.7%) were found to be non-users of smokeless tobacco. In terms of smoking habits, 273 participants (45.5%) were found to be smokers, while 327 (54.5%) were non-smokers. Overall, 381 participants (63.5%) were found to be using tobacco in either smoking or smokeless form, while 219 (36.5%) were non-tobacco users [Table 14 and Figure 11].

Table 15 shows tobacco and non-tobacco usage among transgender participants across different age groups. The prevalence of smokeless tobacco use was relatively consistent across all age groups, with 64.4% in the 21–30 years group, 62.0% in the 31–40 years group, 60.4% in the 41–50 years group, and 63.5% in those over 50 years. No statistically notable association was found in age group and smokeless tobacco use ($p = 0.900$). However, a statistically significant association was observed for smoking tobacco use across age groups ($p < 0.001$). Smoking prevalence increased notably with age: 18.8% in the 21–30 years group, 38.0% in the 31–40 years group, and more than half of the participants in the 41–50 years (55.2%) and >50 years (55.6%) groups were smokers. When considering overall tobacco use (either smoking or smokeless), the prevalence remained similar across all age groups, ranging from 62.0% to 65.3%, with no statistically notable association found between various age group and overall tobacco use ($p = 0.944$) [Table 15].

Oral hygiene practices among transgender participants:

Table 16 presents the distribution of oral hygiene practices among transgender participants. Among the 600 participants the most commonly used method for maintaining oral hygiene was brushing with a toothbrush and toothpaste by 386 participants (64.3%). A significant portion of participants, 101 (16.8%), practiced oral hygiene using their finger with toothpaste, while 77 participants (12.8%) used their finger with tooth powder. Additionally, 36 participants (6.0%) reported using chewsticks as their method of oral hygiene [Table 16 and Figure 12].

Dental treatment needs among transgender participants:

Table 18 presents a comparison of the mean number of various dental treatments required among transgender participants across different age groups, number of one surface fillings was significantly high in older age groups, increasing from 2.85 ± 2.92 in the 21–30 years group to 5.68 ± 5.29 in the 41–50 years group, with a slight decline to 5.29 ± 4.99 in those over 50 years. A statistically notable difference was found ($p < 0.001$). For two surface fillings, the high mean value was seen in the 31–40 years group (2.08 ± 2.04), with lower values in other age groups; this difference was also statistically significant ($p < 0.001$). The need for pulpal care showed a gradual increase with age, ranging from 0.52 ± 1.04 in the 21–30 years group to 0.78 ± 1.38 in those above 50 years, and the association was statistically significant ($p = 0.011$). Although mean number of extractions slightly increased with age—from 0.21 ± 0.62 in the youngest group to 0.57 ± 1.87 in the oldest—the difference was not statistically significant ($p = 0.109$). In contrast, the need for prosthesis rose notably with age, from 0.71 ± 0.67 in the youngest group to 1.89 ± 2.52 in those over 50 years, with a highly significant statistical difference ($p < 0.001$) [Table 18].

Table 19 shows distribution of dental treatments among transgender participants across age groups. One surface filling was most common, especially in the 31–40 years group (89.1%). Two surface fillings and pulpal care were notably higher in young age groups ($p <0.001$). Prosthesis use increases with age, highest in the >50 years group (80.3%, $p<0.001$). Tooth extractions showed an upward trend with age but were no notable difference [Table 19].

Table 20 presents overall dental treatment needs distribution among transgender participants. The most common dental treatment need was one surface filling, required by 82.7% of participants. Two surface filling needs were present in 51% of participants, while pulpal care need was found in 29.3%. Extraction need was observed in 16% of participants. Prosthesis need was seen in 53.4% of participants [Table 20 and Figure 13].

Relationship between tobacco usage and oral hygiene practices with dental variables:

Table 21 presents the correlation between dental caries, periodontal disease, and oral mucosal lesions with deleterious habits (smoking/smokeless) among transgender participants. There was no significant correlation between dental caries ($r = 0.01$, $p = 0.806$) and periodontal disease ($r = 0.05$, $p = 0.209$) with deleterious habits. However, a statistically significant positive correlation was found between oral mucosal lesions and deleterious habits ($r = 0.27$, $p < 0.001$), indicating that such habits may be associated with the presence of oral mucosal lesions [Table 21].

Table 22 shows the correlation between dental caries, periodontal disease, and oral mucosal lesions with oral hygiene practices among transgender participants. A statistically significant positive correlation was found for all three variables. Dental caries ($r = 0.19$, $p < 0.001$), periodontal disease ($r = 0.24$, $p < 0.001$), and oral mucosal lesions ($r = 0.30$, $p < 0.001$) were all significantly associated with oral hygiene practices. This suggests that poor oral hygiene practices may contribute to the increased presence of these oral health issues [Table 22].

Table 1: Demographic characteristics of the transgender participants based on age group

Age (in years)	**Frequency (%) N= 600 (%)**
21 - 30 years	101 (16.8%)
31 - 40 years	129 (21.5%)
41 - 50 years	192 (32.0%)
>50 years	178 (29.7%)
Total	600 (100.0%)
Age (Mean ± SD)	44.20 ± 12.59

SD – Standard deviation; All values are expressed as frequency with percentages (in parentheses) and Mean ± SD.

Table 2: Distribution of the transgender participants based on transmen and transwomen

Transgender population	**Frequency (%) N= 600 (%)**
Trans women	531 (88.5%)
Trans men	69 (11.5%)
Total	600 (100.0%)

All values are expressed as frequency with percentages (in parentheses).

Table 3: Comparison of mean decayed, missing and filling component among transgender participants in different age groups

Variable	21-30 years (n=101)	31-40 years (n=129)	41-50 years (n=192)	> 50 years (n=178)	*H*-value	*p*-value
Decayed teeth	5.25 ± 3.54	8.06 ± 4.80	8.25 ± 5.93	7.32 ± 5.38	26.38	<0.001*
Missing teeth	0.89 ± 0.90	1.36 ± 1.78	1.64 ± 2.27	3.26 ± 3.64	52.05	<0.001*
Filled teeth	0.37 ± 0.58	0.21 ± 0.53	0.29 ± 0.58	0.18 ± 0.39	10.57	0.014*
DMFT	6.51 ± 3.91	9.63 ± 5.03	10.17 ± 6.34	10.76 ± 6.89	35.24	<0.001*

*DMFT – Decayed Missing Filled teeth; All values are expressed as Mean ± Standard deviation (SD);The statistical test used: Kruskal Wallis test; level of significance: *p ≤ 0.05 is considered statistically significant.*

Table 4: Distribution of caries prevalence among transgender participants in different age groups

Caries prevalence	21-30 years n=101 (%)	31-40 years n=129 (%)	41-50 years n=192 (%)	> 50 years n=178 (%)	χ^2-value	*p*-value
Caries present	90 (89.1%)	125 (96.9%)	165 (85.9%)	154 (86.5%)	11.18	0.011*
Caries absent	11 (10.9%)	4 (3.1%)	27 (14.1%)	24 (13.5%)		
Total	101 (100.0%)	129 (100.0%)	192 (100.0%)	178 (100.0%)		

*All values are expressed as the frequency with percentages (in parentheses). The statistical test used: Chi-square test; level of significance: *p ≤ 0.05 is considered a statistically significant association.*

Table 5: Distribution of bleeding on probing among transgender participants in different age groups

Bleeding on probing	21-30 years n=101 (%)	31-40 years n=129 (%)	41-50 years n=192 (%)	> 50 years n=178 (%)	χ^2-value	*p*-value
BOP present	61 (60.4%)	81 (62.8%)	157 (81.8%)	151 (84.8%)	35.62	<0.001*
BOP absent	40 (39.6%)	48 (37.2%)	35 (18.2%)	27 (15.2%)		
Total	101 (100.0%)	129 (100.0%)	192 (100.0%)	178 (100.0%)		

*BOP: Bleeding on probing; All values are expressed as the frequency with percentages (in parentheses). The statistical test used: Chi-square test; level of significance: *p ≤ 0.05 is considered a statistically significant association.*

Table 6: Distribution of loss of attachment among transgender participants in different age groups

Loss of attachment	21-30 years n=101 (%)	31-40 years n=129 (%)	41-50 years n=192 (%)	> 50 years n=178 (%)	χ^2-value	*p*-value
LOA present	57 (56.4%)	80 (62.0%)	157 (81.8%)	151 (84.8%)	42.88	<0.001*
LOA absent	44 (43.6%)	49 (38.0%)	35 (18.2%)	27 (15.2%)		
Total	101 (100.0%)	129 (100.0%)	192 (100.0%)	178 (100.0%)		

*LOA: Loss of attachment; All values are expressed as the frequency with percentages (in parentheses). The statistical test used: Chi-square test; level of significance: *p ≤ 0.05 is considered a statistically significant association.*

Table 7: Distribution of periodontal probing depth among transgender participants in different age groups

Periodontal probing depth	21-30 years n=101 (%)	31-40 years n=129 (%)	41-50 years n=192 (%)	> 50 years n=178 (%)	χ^2-value	*p*-value
PPD present	43 (42.6%)	60 (46.5%)	146 (76.0%)	128 (71.9%)	53.09	<0.001*
PPD absent	58 (57.4%)	69 (53.5%)	46 (24.0%)	50 (28.1%)		
Total	101 (100.0%)	129 (100.0%)	192 (100.0%)	178 (100.0%)		

*PPD: Periodontal probing depth; All values are expressed as the frequency with percentages (in parentheses). The statistical test used: Chi-square test; level of significance: *p ≤ 0.05 is considered a statistically significant association.*

Table 8: Distribution of periodontal prevalence among transgender participants in different age groups

Periodontal prevalence	21-30 years n=101 (%)	31-40 years n=129 (%)	41-50 years n=192 (%)	> 50 years n=178 (%)	χ^2-value	*p*-value
Present	37 (36.6%)	44 (34.1%)	158 (82.3%)	154 (86.5%)	31.56	<0.001*
Absent	64 (63.4%)	85 (65.9%)	34 (17.7%)	24 (13.5%)		
Total	101 (100.0%)	129 (100.0%)	192 (100.0%)	178 (100.0%)		

*All values are expressed as the frequency with percentages (in parentheses). The statistical test used: Chi-square test; level of significance: *p ≤ 0.05 is considered a statistically significant association.*

Table 9: Distribution of traumatic injury to the tooth among transgender participants in different age groups

Traumatic injury	21-30 years n=101 (%)	31-40 years n=129 (%)	41-50 years n=192 (%)	> 50 years n=178 (%)	χ^2-value	*p*-value
Present	9 (8.9%)	18 (14.0%)	19 (9.9%)	16 (9.0%)	2.43	0.488
Absent	92 (91.1%)	111 (86.0%)	173 (90.1%)	162 (91.0%)		
Total	101 (100.0%)	129 (100.0%)	192 (100.0%)	178 (100.0%)		

*All values are expressed as the frequency with percentages (in parentheses). The statistical test used: Chi-square test; level of significance: *p ≤ 0.05 is considered a statistically significant association.*

Table 10: Distribution of oral mucosal lesion among transgender participants in different age groups

Oral mucosal lesion	21-30 years n=101 (%)	31-40 years n=129 (%)	41-50 years n=192 (%)	> 50 years n=178 (%)	χ^2-value	*p*-value
Oral submucous fibrosis	8 (7.9%)	20 (15.5%)	10 (5.2%)	11 (6.2%)		
Lichen planus	4 (4.0%)	3 (2.3%)	9 (4.7%)	5 (2.8%)		
Leukoplakia	2 (2.0%)	4 (3.1%)	10 (5.2%)	10 (5.6%)	16.53	0.168
Erythroplakia	2 (2.0%)	2 (1.6%)	3 (1.6%)	4 (2.2%)		
Absent	85 (84.2%)	100 (77.5%)	160 (83.3%)	148 (83.1%)		
Total	101 (100.0%)	129 (100.0%)	192 (100.0%)	178 (100.0%)		

*All values are expressed as the frequency with percentages (in parentheses). The statistical test used: Chi-square test; level of significance: *p ≤ 0.05 is considered a statistically significant association.*

Table 11: Distribution of oral mucosal lesion location among transgender participants in different age groups

Oral mucosal lesion	21-30 years n=101 (%)	31-40 years n=129 (%)	41-50 years n=192 (%)	> 50 years n=178 (%)	χ^2-value	*p*-value
Buccal mucosa	12 (11.9%)	24 (18.6%)	27 (14.1%)	25 (14.0%)		
Hard/Soft palate	3 (3.0%)	3 (2.3%)	1 (0.5%)	1 (0.6%)		
Sulci	0 (0.0%)	0 (0.0%)	2 (1.0%)	2 (1.1%)	11.96	0.682
Gingiva	1 (1.0%)	1 (0.8%)	2 (1.0%)	1 (0.6%)		
Tongue	0 (0.0%)	1 (0.8%)	0 (0.0%)	1 (0.6%)		
Absent	85 (84.2%)	100 (77.5%)	160 (83.3%)	148 (83.1%)		
Total	101 (100.0%)	129 (100.0%)	192 (100.0%)	178 (100.0%)		

*All values are expressed as the frequency with percentages (in parentheses). The statistical test used: Chi-square test; level of significance: *p ≤ 0.05 is considered a statistically significant association.*

Table 12: Overall distribution of dental parameters among transgender participants

Dental parameters	Present n (%)	Absent n (%)
Caries prevalence	534 (89.0%)	66 (11.0%)
Bleeding on probing	450 (75.0%)	150 (25.0%)
Loss of attachment	445 (74.2%)	155 (25.8%)
Periodontal pocket depth	377 (62.8%)	223 (37.2%)
Periodontal prevalence	461 (76.8%)	139 (23.2%)
Traumatic injury	62 (10.3%)	538 (89.7%)
Oral mucosal lesion	112 (18.7%)	488 (81.3%)

All values are expressed as frequency with percentages (in parentheses).

Table 13: Overall distribution of dental parameters among transwomen and transmen participants

Dental Parameters	Condition	Transwomen N=600 (%)	Transmen N=69 (%)	χ^2- value	*p*-value
Caries prevalence	Absent	56 (10.5%)	10 (14.5%)	0.97	0.324
	Present	475 (89.5%)	59 (85.5%)		
Periodontal prevalence	Absent	117 (22.0%)	22 (31.9%)	3.33	0.068
	Present	414 (78.0%)	47 (68.1%)		
Tobacco usage	Absent	192 (36.2%)	27 (39.1%)	0.23	0.629
	Present	339 (63.8%)	42 (60.9%)		

*All values are expressed as the frequency with percentages (in parentheses). The statistical test used: Chi-square test; level of significance: *p ≤ 0.05 is considered a statistically significant association.*

Table 14: Distribution of tobacco and non-tobacco users among transgender participants

Tobacco users	**Frequency n=600 (%)**
Smokeless users	
Areca nut chewing	199 (33.2%)
Gutkha	79 (13.2%)
Toombak (snuff)	59 (9.8%)
Others	37 (6.2%)
Total smokeless users	374 (62.3%)
Non smokeless users	226 (37.7%)
Smoking form	
Present	273 (45.5%)
Absent	327 (54.5%)
Tobacco users (smoke/smokeless)	381 (63.5%)
Non tobacco users	219 (36.5%)
Total	600 (100.0%)

All values are expressed as frequency with percentages (in parentheses).

Table 15: Distribution of tobacco and non-tobacco users among transgender participants in different age groups

Tobacco prevalence	21-30 years n=101 (%)	31-40 years n=129 (%)	41-50 years n=192 (%)	> 50 years n=178 (%)	χ^2- value	*p*-value
Smokeless form						
Present	65 (64.4%)	80 (62.0%)	116 (60.4%)	113 (63.5%)	0.58	0.900
Absent	36 (35.6%)	49 (38.0%)	76 (39.6%)	65 (36.5%)		
Smoking form						
Present	19 (18.8%)	49 (38.0%)	106 (55.2%)	99 (55.6%)	46.60	<0.001*
Absent	82 (81.2%)	80 (62.0%)	86 (44.8%)	79 (44.4%)		
Overall tobacco users						
Present	66 (65.3%)	83 (64.3%)	119 (62.0%)	113 (63.5%)	0.38	0.944
Absent	35 (34.7%)	46 (35.7%)	73 (38.0%)	65 (36.5%)		

*All values are expressed as the frequency with percentages (in parentheses). The statistical test used: Chi-square test; level of significance: *p ≤ 0.05 is considered a statistically significant association.*

Table 16: Distribution of oral hygiene practices among transgender participants

Oral hygiene practices	Frequency n=600 (%)
Tooth brush with toothpaste	386 (64.3%)
Finger with toothpaste	101 (16.8%)
Finger with powder	77 (12.8%)
Chewsticks	36 (6.0%)
Total	600 (100.0%)

All values are expressed as frequency with percentages (in parentheses).

Table 17: Distribution of oral hygiene practices among transgender participants in different age groups

Oral hygiene practices	21-30 years n=101 (%)	31-40 years n=129 (%)	41-50 years n=192 (%)	> 50 years n=178 (%)	χ^2-value	*p*-value
Toothbrush with toothpaste	85 (84.2%)	105 (81.4%)	124 (64.6%)	72 (40.4%)		
Finger with toothpaste	8 (7.9%)	11 (8.5%)	37 (19.3%)	45 (25.3%)	81.31	<0.001*
Finger with powder	5 (5.0%)	10 (7.8%)	21 (10.9%)	41 (23.0%)		
Chewsticks	3 (3.0%)	3 (2.3%)	10 (5.2%)	20 (11.2%)		
Total	101 (100.0%)	129 (100.0%)	192 (100.0%)	178 (100.0%)		

*All values are expressed as the frequency with percentages (in parentheses). The statistical test used: Chi-square test; level of significance: *p ≤ 0.05 is considered a statistically significant association.*

Table 18: Comparison of mean dental treatment among transgender participants in different age groups

Dental treatments	21-30 years (n=101)	31-40 years (n=129)	41-50 years (n=192)	> 50 years (n=178)	*H*-value	*p*-value
One surface filling	2.85 ± 2.92	4.62 ± 3.68	5.68 ± 5.29	5.29 ± 4.99	24.86	<0.001*
Two surface filling	1.47 ± 1.30	2.08 ± 2.04	1.42 ± 2.15	1.18 ± 1.65	24.75	<0.001*
Pulpal care	0.52 ± 1.04	0.68 ± 1.62	0.73 ± 1.19	0.78 ± 1.38	11.13	0.011*
Extraction	0.21 ± 0.62	0.32 ± 0.85	0.39 ± 1.17	0.57 ± 1.87	6.06	0.109
Prosthesis	0.71 ± 0.67	0.84 ± 1.05	1.11 ± 1.58	1.89 ± 2.52	35.72	<0.001*

*All values are expressed as Mean ± Standard deviation (SD);The statistical test used: Kruskal Wallis test; level of significance: *p ≤ 0.05 is considered statistically significant.*

Table 19: Distribution of dental treatments among transgender participants in different age groups

Dental treatments	21-30 years n=101 (%)	31-40 years n=129 (%)	41-50 years n=192 (%)	> 50 years n=178 (%)	χ^2- value	*p*-value
One surface filling						
Present	87 (86.1%)	115 (89.1%)	149 (77.6%)	145 (81.5%)	8.25	0.041*
Absent	14 (13.9%)	14 (10.9%)	43 (22.4%)	33 (18.5%)		
Two surface filling						
Present	66 (65.3%)	90 (69.8%)	76 (39.6%)	74 (41.6%)	42.84	<0.001*
Absent	35 (34.7%)	39 (30.2%)	116 (60.4%)	104 (58.4%)		
Pulpal care						
Present	38 (37.6%)	51 (39.5%)	42 (21.9%)	45 (25.3%)	16.39	<0.001*
Absent	63 (62.4%)	78 (60.5%)	150 (78.1%)	133 (74.7%)		
Extraction						
Present	13 (12.9%)	20 (15.5%)	28 (14.6%)	35 (19.1%)	6.74	0.081
Absent	88 (87.1%)	109 (84.5%)	164 (85.4%)	143 (80.9%)		
Prosthesis						
Present	62 (61.4%)	78 (60.5%)	121 (63.0%)	143 (80.3%)	19.70	<0.001*
Absent	39 (38.6%)	51 (39.5%)	71 (37.0%)	35 (19.7%)		

*All values are expressed as the frequency with percentages (in parentheses). The statistical test used: Chi-square test; level of significance: *p ≤ 0.05 is considered a statistically significant association.*

Table 20: Distribution of dental treatments among transgender participants

Dental treatments	Present n (%)	Absent n (%)
One surface filling	496 (82.7%)	104 (17.3%)
Two surface filling	306 (51.0%)	294 (49.0%)
Pulpal care	176 (29.3%)	424 (70.7%)
Extraction	96 (16.0%)	504 (84.0%)
Prosthesis	404 (53.4%)	196 (32.7%)

All values are expressed as frequency with percentages (in parentheses).

Table 21: Correlation between dental caries, periodontal disease and oral mucosal lesion with deleterious habit (smoking/smokeless) among transgenders participants

Variable	Deleterious habits (Smoking/Smokeless)	
Dental caries	rho	0.01
	p	0.806
Periodontal disease	rho	0.05
	p	0.209
Oral mucosal lesion	rho	0.27
	p	<0.001*

The statistical test used: Spearman correlation coefficient, p -value ≤0.05 considered statistically significant

Table 22: Correlation between dental caries, periodontal disease and oral mucosal lesion with oral hygiene practices among transgender participants

Variable		Oral hygiene practices
Dental caries	rho	0.19
	p	<0.001*
Periodontal disease	rho	0.24
	p	<0.001*
Oral mucosal lesion	rho	0.30
	p	<0.001*

The statistical test used: Spearman correlation coefficient, p -value ≤0.05 considered statistically significant

Figure 1: Demographic characteristics of the transgender participants based on age group.

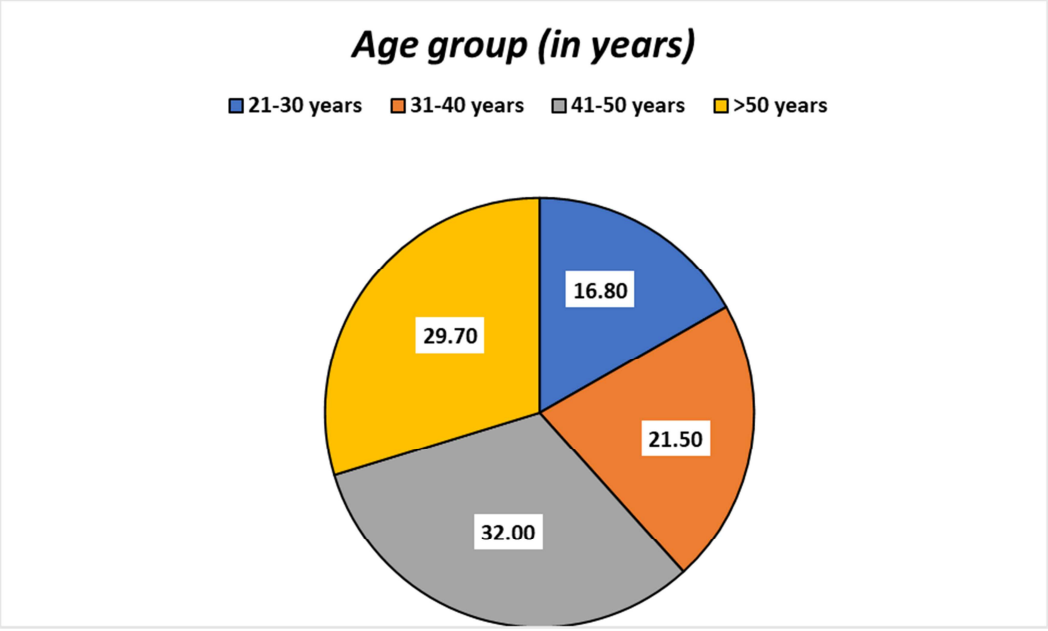


Figure 2: Distribution of the transgender participants based on transmen and transwomen.

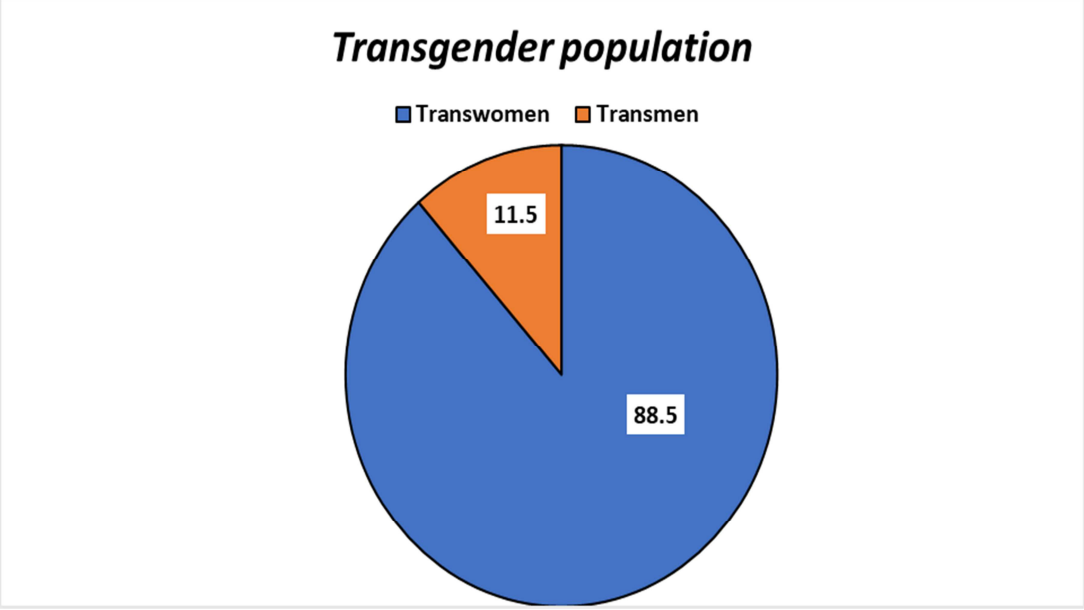


Figure 3: Comparison of mean decayed component among transgender participants in different age groups.

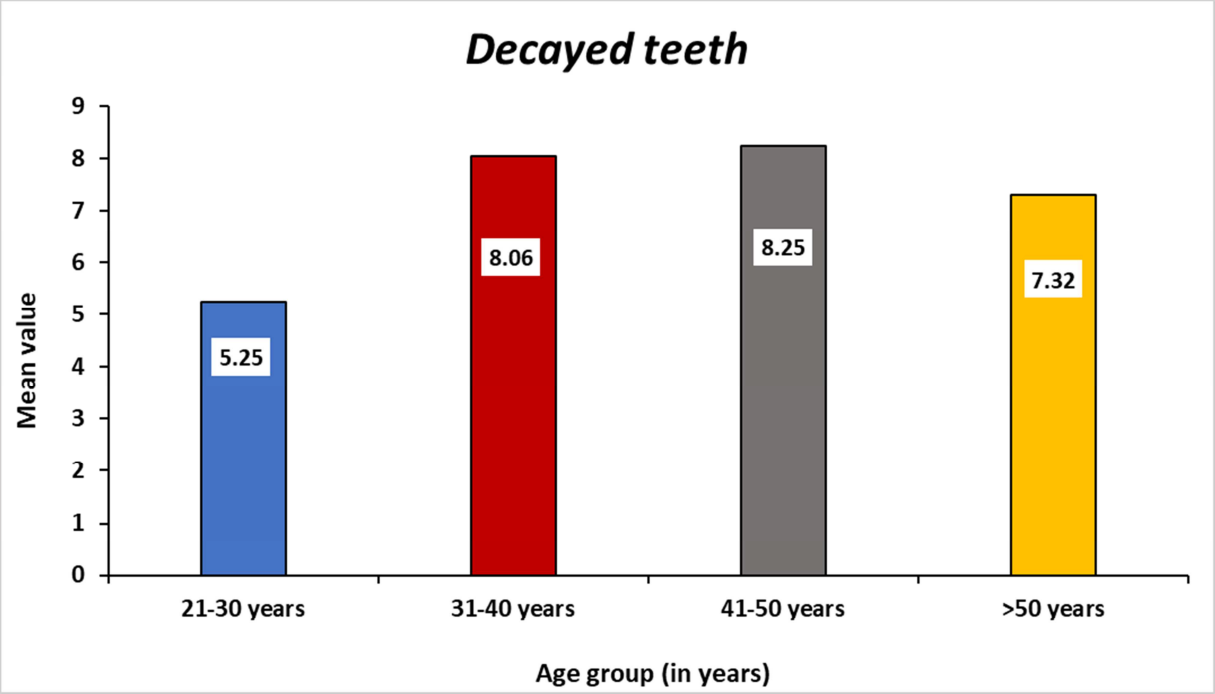


Figure 4: Comparison of mean missing component among transgender participants in different age groups.

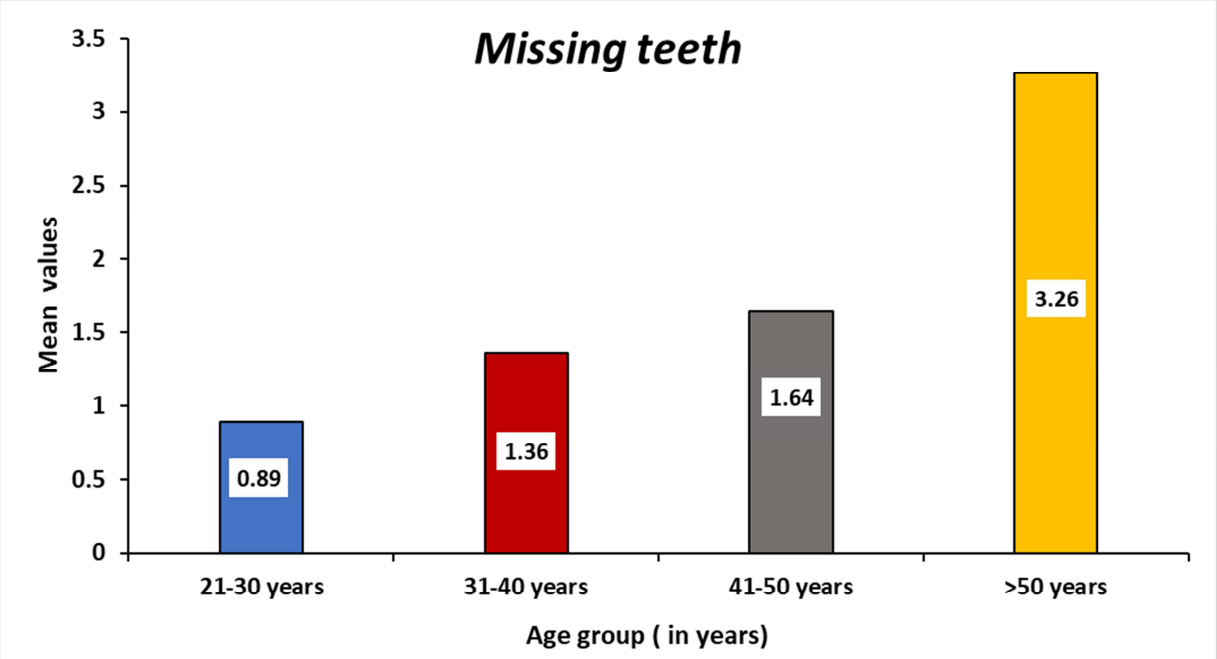


Figure 5: Comparison of mean filled component among transgender participants in different age groups.

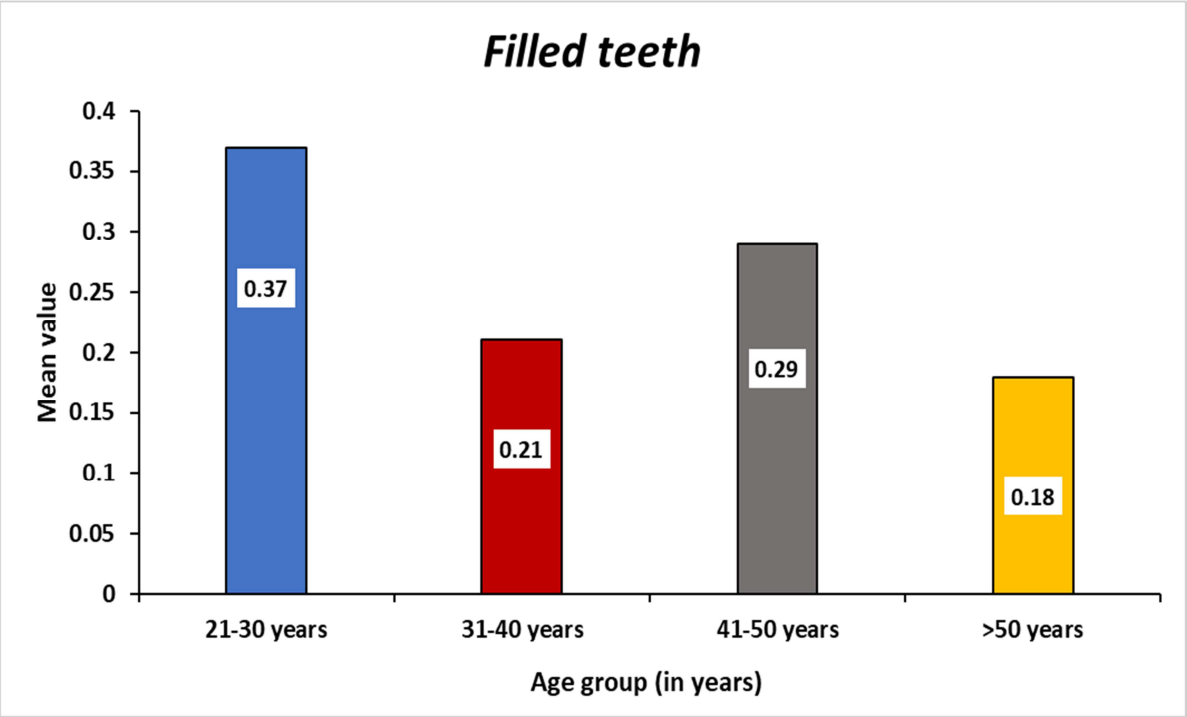


Figure 6: Comparison of mean DMFT component among transgender participants in different age groups; (DMFT: Decayed, Filled, Missing teeth).

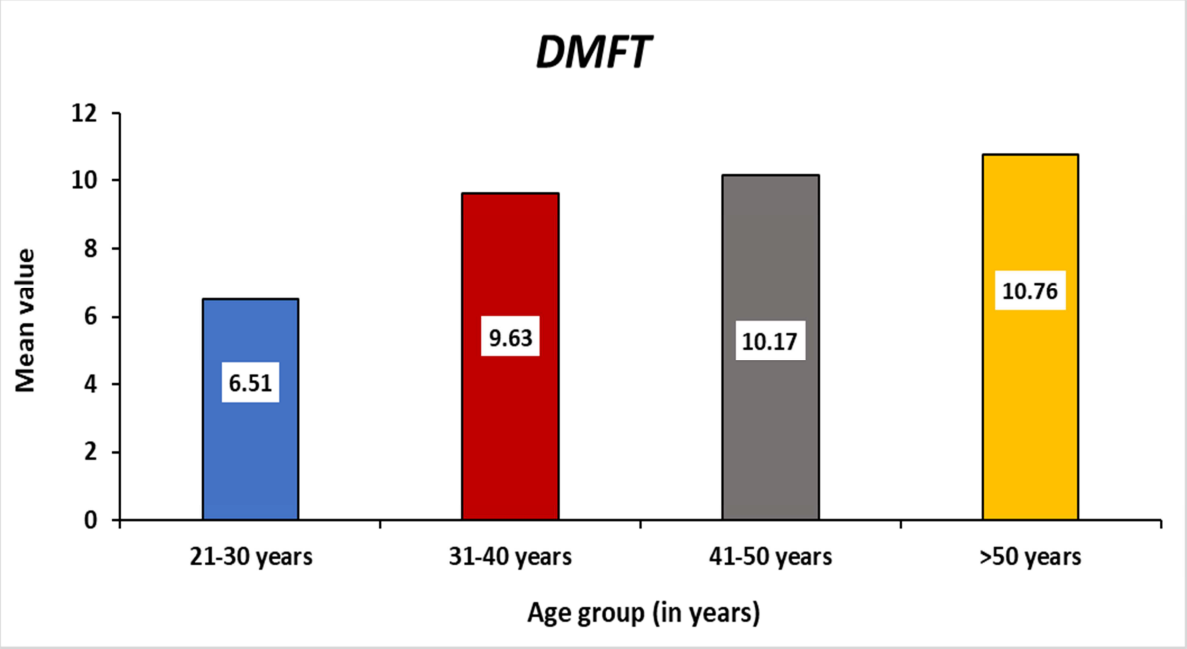


Figure 7: Overall mean prevalence of decayed, missing and filled component of DMFT Index among transgender participants; (DMFT: Decayed, Filled, Missing teeth).

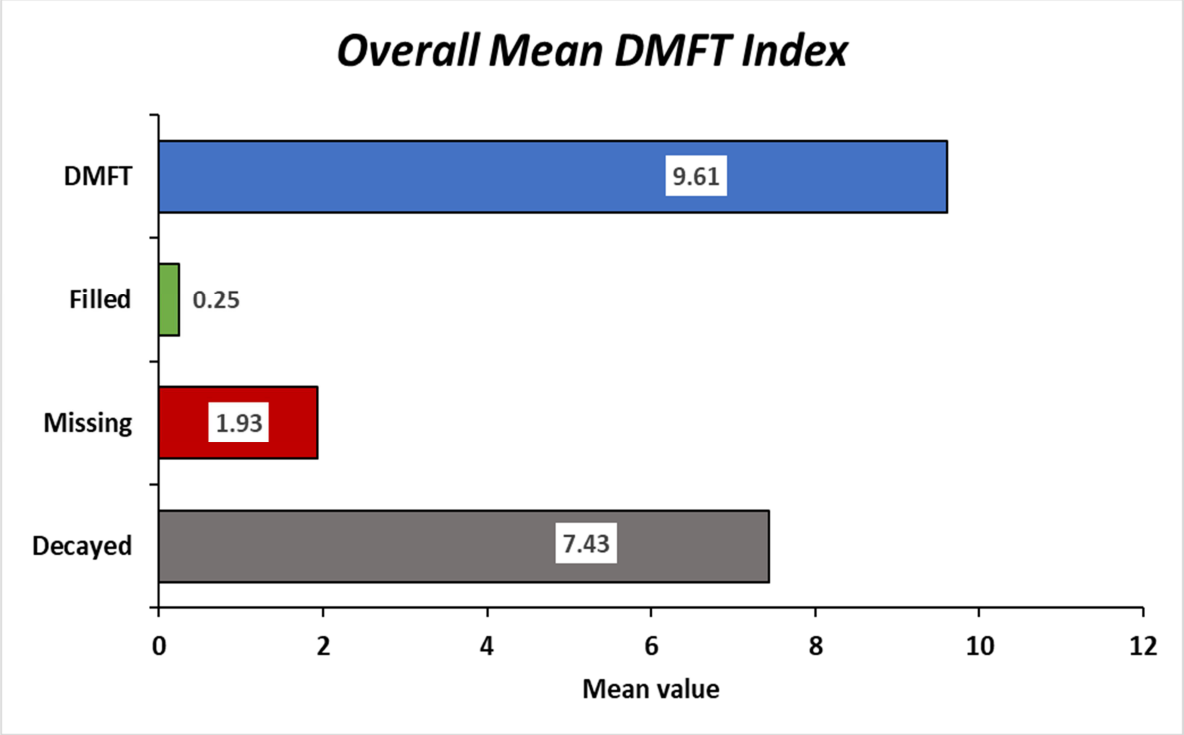


Figure 8: Overall prevalence of dental caries and periodontal disease among transgender participants.

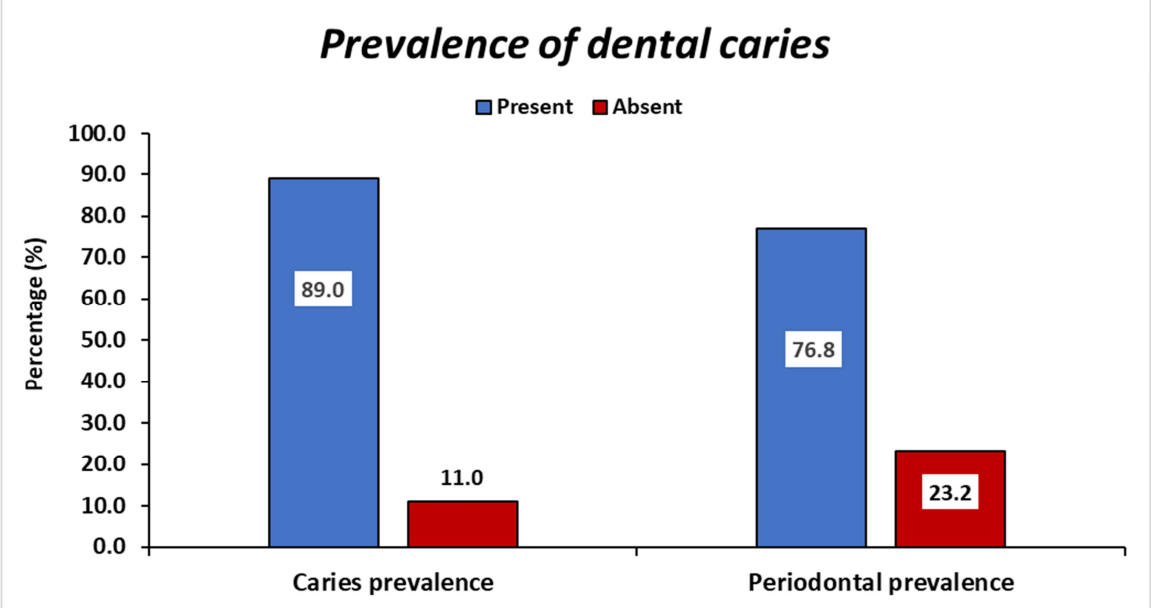


Figure 9: Overall prevalence of bleeding on probing, loss of attachment and periodontal probing depth among transgender participants (BOP: Bleeding on probing, LOA: Loss of attachment and PPD: Periodontal probing depth)

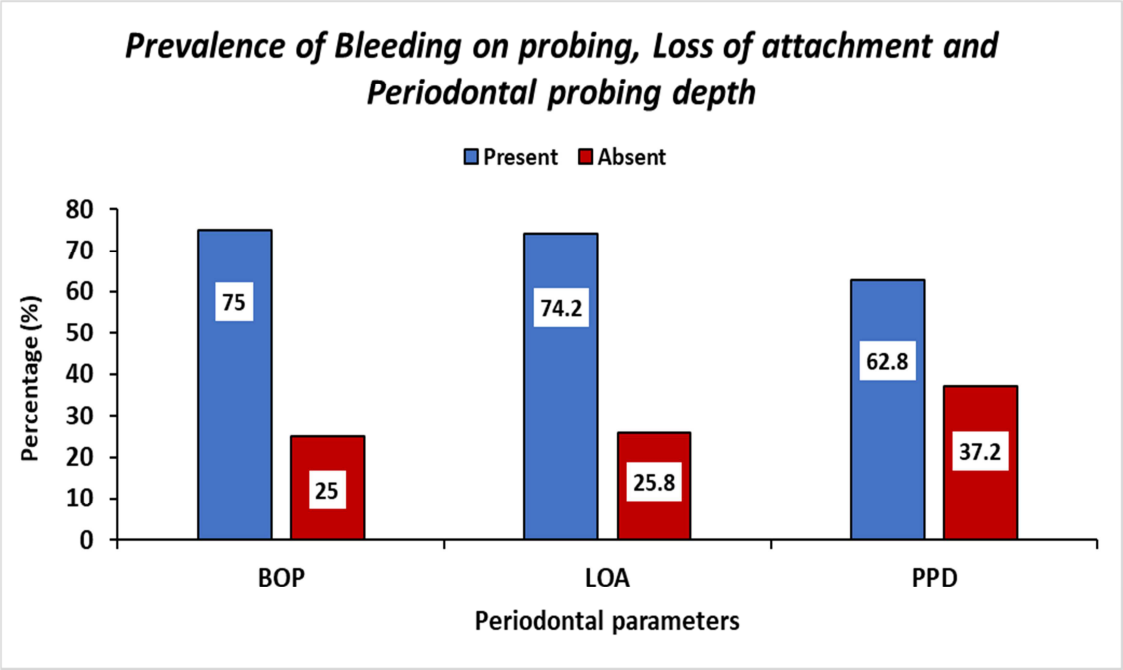


Figure 10: Overall mean prevalence of traumatic injury and oral mucosal lesion among transgender participants.

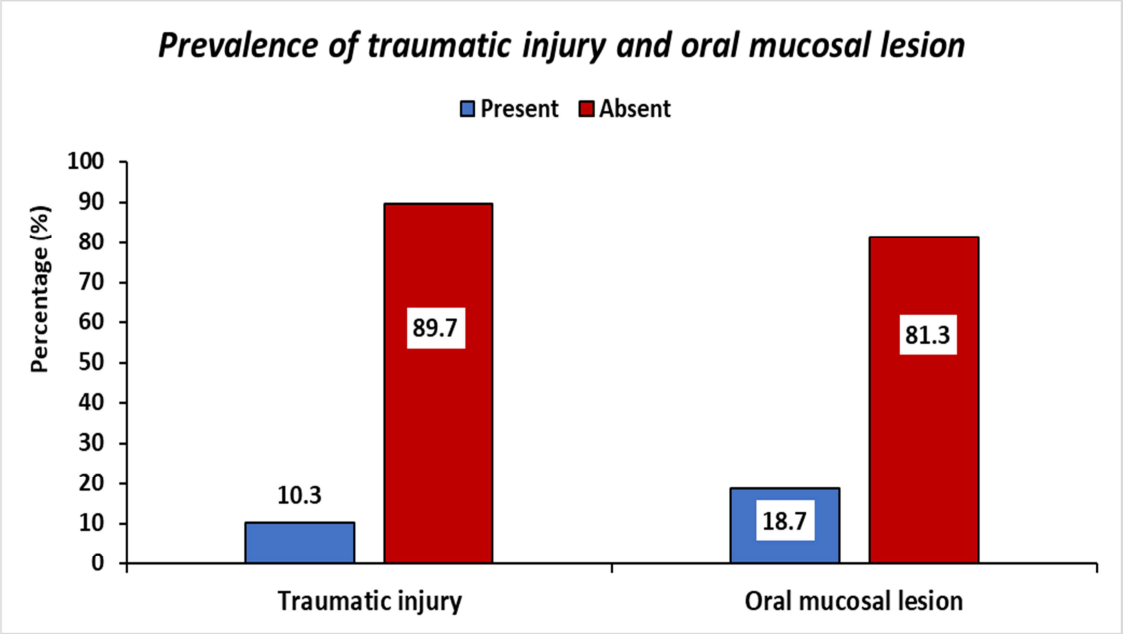


Figure 11: Overall mean prevalence of tobacco usage among transgender

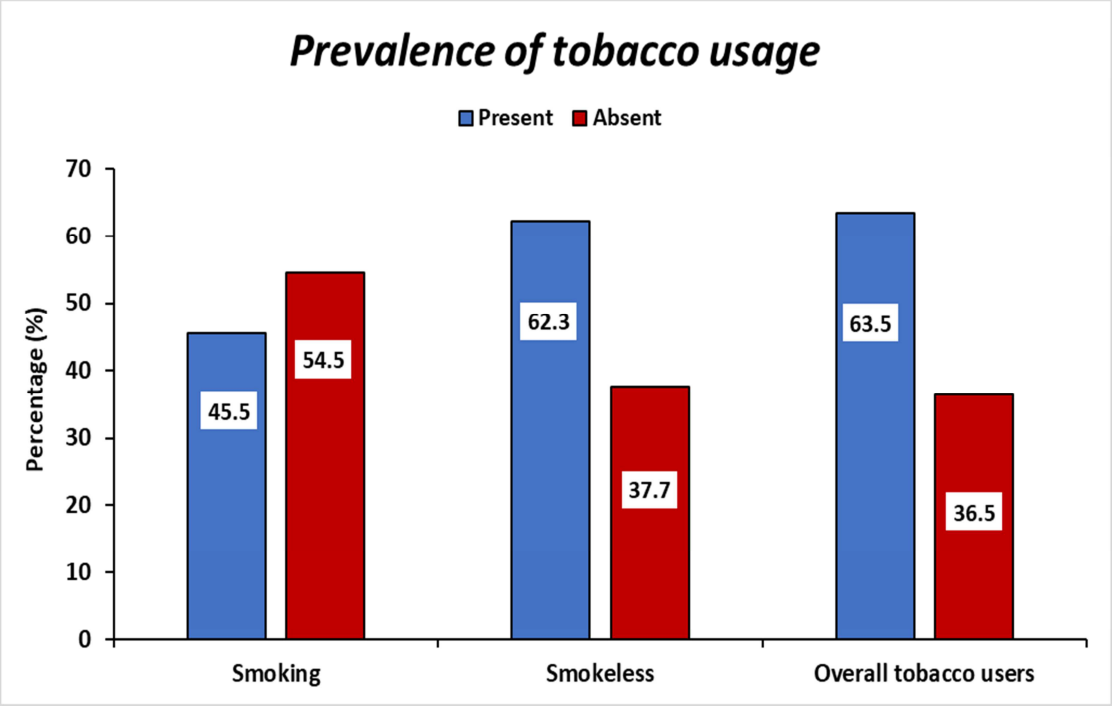


Figure 12: Overall mean prevalence of tobacco usage among transgender

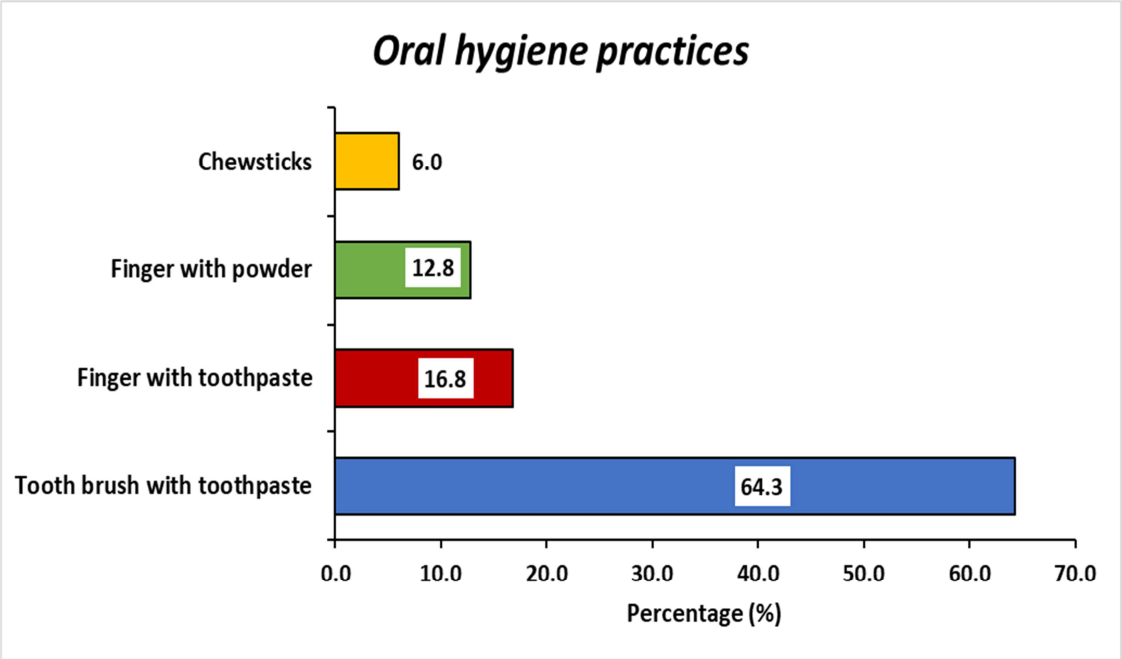
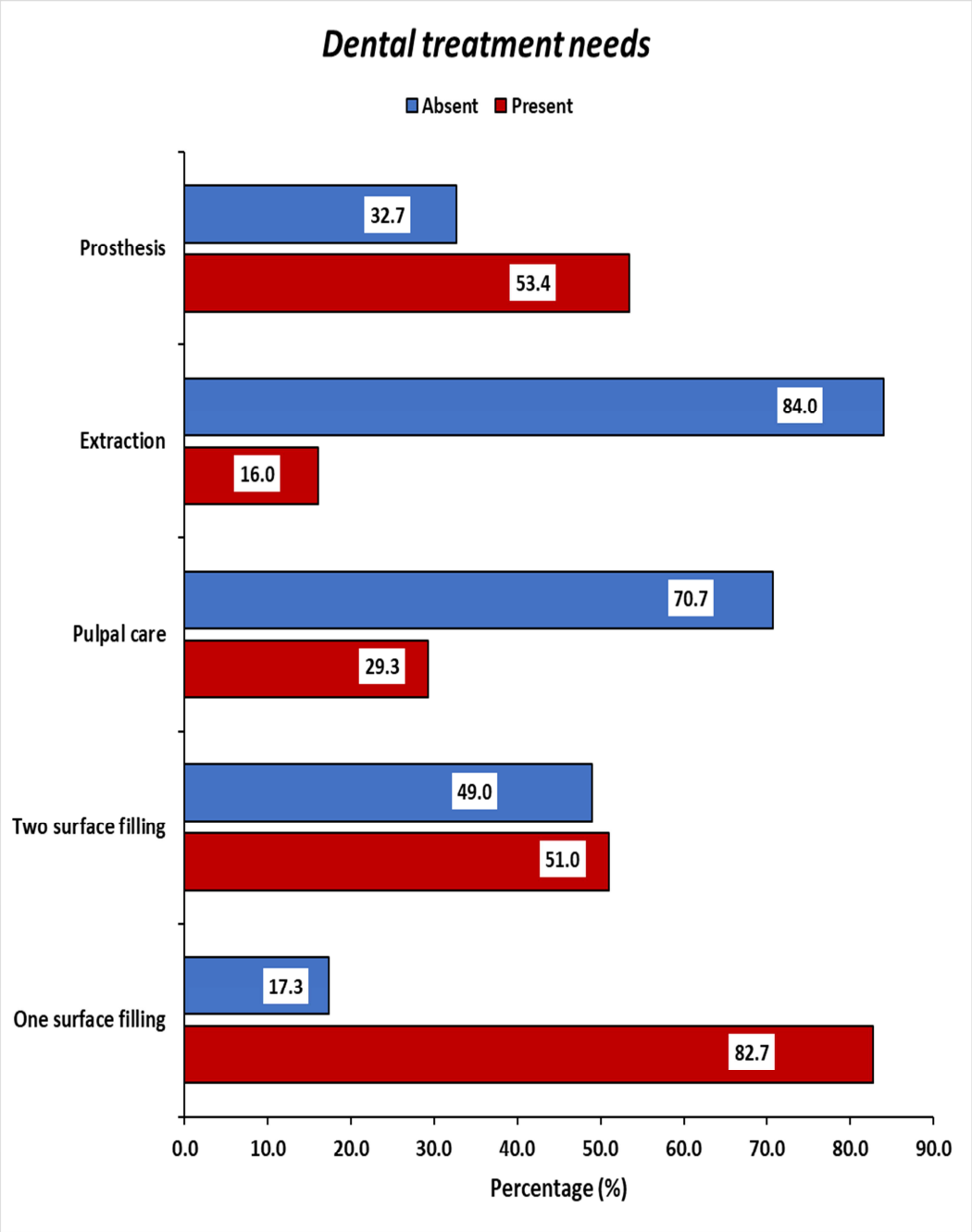


Figure 13: Distribution of dental treatment needs among transgender participants.



DISCUSSION

Health was considered crucial for all individuals, including those who identified as transgender. There was a well-established connection between oral health and overall health. However, despite this connection, awareness regarding oral health among transgender individuals remained considerably low. An existing stigma in society associated with the transgender population often acted as a barrier for the community to access dental care. A systematic review by Kumar et al. found that this population exhibited a notably high prevalence of dental caries, periodontal disease, and oral mucosal lesions.[17]

Thus, the objective of this study was to assess the oral health status and treatment requirements of transgender individuals in the Belagavi district, Karnataka. To the best of our knowledge, this is the first study in the district to examine the oral health conditions of the transgender population with a large sample size. The study provides insights into dental caries, periodontal disease, oral mucosal lesions prevalence and other dental concerns, while also identifying the treatment needs specific to this group.

Study population:

The study included transgender individuals residing in the Belagavi district of Karnataka. Most participants were transwomen, but the sample also comprised a few transmen. A sample of 600 transgender people included in the study, they recruited using community outreach and an association with the Transgender Humanity Foundation to ensure representativeness. Prior to participation, each individual was provided with detailed information about the study's objectives and procedures.

Informed consent was obtained from all participants in accordance with ethical guidelines.

Age:

The age range of transgender participants in Belagavi district spanned from 21 to 75 years. The majority of participants were in the age group of 41–50 years, followed by those in the over 50 years and 31–40 years categories. The fewest participants were in the 21–30 years age group. This distribution indicates that middle-aged and older transgender people were more visible and accessible within the community, perhaps indicating trends of community participation or stability within the area.

Dental caries:

In our study, we found that the percentage of dental caries, a chronic and multifactorial condition influenced by factors such as host, diet, microbiota, and time, was significantly high among transgender individuals, reaching 89.0%. Such a high number reflects a grave public health issue among this marginalized community. The results conform to earlier work that has been done within the Belagavi district as well as in other parts of India. For example, Gadhiraju et al. reported dental caries prevalence in 72.2% transgender individuals in the same district,[1] which substantiates our observation of heavy disease burden. The same was found in a study by Marlecha R et al. in Chennai, where caries prevalence in 73.6% transgender individuals was found.[29] These persistent trends throughout different studies indicate an epidemic oral health problem within the transgender community that needs to be addressed.

When the oral health status was evaluated using the DMFT index, a widely accepted and standardized method for assessing caries experience, the mean score was

found to be significantly higher. These results align with those of studies by Manpreet K. et al. in Bangalore,[2] Suleman M. et al. in Lahore,[21] and Muralidharan S. et al. in Pune,[33] all of which also reported elevated DMFT scores among transgender individuals in their respective regions.

Conversely, our results differ from those of Kumar G. et.al., found out a lower DMFT value in a study conducted among transgender individuals in Odisha. [22] Similarly, Samuel et al., in their study among transgender individuals in Pondicherry, Tamil Nadu, also observed a lower DMFT index, [34] the differences in DMFT scores across regions highlight the importance of further investigating the underlying factors that contribute to disparities in the transgender community.

An analysis of the "Filled" component of the DMFT index revealed a notably low mean value in our study. This suggests inadequate utilization and limited awareness of dental health conditions, leads to a high prevalence of untreated dental issues. These results align with those of Samuel et al. in Pondicherry,[34] Manpreet K et al. in Bangalore,[2] Suleman M et al. in Lahore,[21] and Muralidharan S et al. in Pune,[33] all of whom reported similarly low filled teeth values among transgender individuals, suggesting systemic barriers to accessing timely and adequate dental treatment. In the study, the DMFT value increased with respect to age; as age increased, the mean DMFT score also rose. This finding is consistent with the systematic review by Chan A.K.Y. et al., which reported that root caries tends to increase with age. [54] This consistently high dental caries prevalence and elevated DMFT scores observed in most regions highlighted the urgent need for comprehensive oral health programs, increased awareness, and dental care services that are both inclusive and specifically designed to address the unique needs of the transgender community.

Periodontal disease:

Similar to the high dental caries prevalence, the periodontal disease among transgenders was also found to be notably high in our study. This observation underscores a significant oral health concern within this marginalized population. Our results align with several earlier studies across different places of India, further highlighting a widespread pattern. For instance, Gadhiraju et.al., found out a periodontal disease prevalence of 92.2% among transgender individuals in the Belagavi district.[1] Similarly, Saravanan N. et al., in Chennai, documented a percentage of 83%,[39] while Torwane et al. reported an 86.5% prevalence rate among the transgender population in Bhopal city, Madhya Pradesh.[38] These consistently high rates of periodontal disease across geographically and culturally diverse regions indicate a systemic neglect of oral health in the transgender community.

In the present study, clinical indicators such as bleeding on probing, periodontal pocket depth, and loss of attachment were observed in approximately 70% of the individuals. This finding aligns with the study done by Gadhiraju et.al., the periodontal pocket depth reported to be 88% of participants.[1] Similarly, loss of attachment was observed in 50% of participants in the study by R. Bharath Marlecha et.al., conducted in Chennai,[29] and the study done by Kumar G. et.al., in Odisha.[22] These results highlight the urgent need for focused periodontal health initiatives and improved access to oral healthcare services tailored to the transgender community.

Oral mucosal lesion:

In this study, 18.7% of the transgender participants were found to have oral mucosal lesions., with Oral Submucous Fibrosis (OSMF) being the most commonly observed lesion, followed by leukoplakia and lichen planus, while erythroplakia was

the least frequently detected. This finding aligns with previous research highlighting a high burden of oral mucosal lesions in transgender populations. For instance, Manpreet et al. found that approximately 20% of transgender individuals in Bangalore exhibited leukoplakia.[2] Similarly, S.R. Samuel et al., in the study conducted among transgender individuals in Pondicherry, documented the presence of various mucosal lesions including leukoplakia, lichen planus, candidiasis, and tobacco pouch keratosis.[34]

These patterns indicates that the lifestyle factors such as tobacco usage both smoking and smokeless forms, poor oral care, and restricted access to dental treatment services may contribute to the development of these lesions.

Tobacco usage (Smoking and Smokeless):

In this study, out of the 600 subjects, 62.3% were identified as users of smokeless tobacco. In terms of smoking, 45.5% of the people were smokers, and 54.5% were non-smokers. In total, 63.5% of the study population were tobacco users in either the smokeless or smoking format, while 36.5% were not tobacco users. Out of the smokeless tobacco items, the areca nut was the most widely used (33.2%), followed by gutkha (13.2%), toombak or snuff (9.8%), and other (6.2%).

These results corroborate the earlier studies that were done in other regions. A study by Gadhiraju et.al., tobacco (both smoke and smokeless) was seen to be prevalent in 93.3%.[1] Likewise, a study done in Bangalore, Manpreet et.al, also saw smoking and smokeless use of tobacco as 44.0% and 30.0%, respectively.[2] Kumbhalwar et al. showed that 57.1% of people were using tobacco.[26] S.R. Samuel et al. identified that 82.4% of respondents were using chew products.[34] In the Puducherry, Tamil Nadu, study by Sathyanarayanan and John, 61% of participants

had used tobacco.[23] Suleman M et al., in their Lahore, India study, found that 40% of the population used tobacco.[21] Further, Muhammad M et al., in their study from Pakistan, indicated that 98.7% of respondents were currently using betel nut, pan, or tobacco.[25] These results collectively indicate that the prevalence of tobacco consumption is significantly high among transgender people.

Oral hygiene practices:

In this research, out of 600 participants, the most widely used oral hygiene method was toothbrush and toothpaste, by 386 participants (64.3%). Most participants, 101 (16.8%), used their finger with toothpaste as a means of oral hygiene, while 77 participants (12.8%) used their finger with tooth powder. Some 36 participants (6.0%) indicated that they used chewsticks as their oral hygiene method. These results point toward a significant difference in oral hygiene habits between the transgender population, with a large percentage continuing to use older or less efficient practices.

This was in line with a number of earlier studies undertaken in different regions of India. In a study conducted by Gadhiraju et.al., the authors indicated that 47% of the subjects employed a toothbrush and toothpaste, 30% employed their finger and toothpaste, 9.44% employed chewsticks, and 12.78% employed their finger and salt or tooth powder.[1] Similarly, 85.83% of the participants used a toothbrush and toothpaste, 17.50% used a finger along with tooth powder, and 14.17% did not brush their teeth at all in a study done in Western Maharashtra by Garade et al.[20] In a study by Shanmugam M, conducted in Chidambaram, Tamil Nadu, it was reported that 86% of the transgender individuals used a toothbrush for cleaning their teeth, while 13.6% still relied on their fingers for brushing.[24]

In addition, a systematic review conducted by Mehta et al. showed that the pooled prevalence of toothbrush use in transgender people in India was 83%, which is a fairly high rate of awareness of contemporary oral hygiene instruments in certain areas.[19] Nevertheless, our study indicates that the lower rate indicates possible lacunae in oral health education and availability. These results point to the imperative of specially designed oral health promotion programs for enhancing hygiene practice in this group.

Dental treatment needs:

Among participants in this study, the most frequent dental need that was discovered was a one-surface filling, which was necessary for 82.7% of participants. This was trailed by the two-surface filling requirement reported among 51% of the participants, whereas pulpal care necessity was registered in 29.3% of participants. The necessity of extraction was in 16% of participants, noting the availability of severely broken-down or non-restorable teeth. Further, 53.4% of the participants showed signs of prosthetic treatment requirements, an indication of a substantial prevalence of missing teeth and the need for functional oral restoration.

These results are very much similar to the work of Gadhiraju et.al., where, one-surface filling was also found to be the most prevalent dental treatment requirement, at 50.18% among the transgender group under study, followed by extraction requirements seen in 23.24%.[1] Likewise another studies by Muralidharan S et.al., in Pune, Maharashtra, found that one-surface filling needs were applicable to 58.9% of the participants, two-surface filling needs to 17.0%, pulpal care needs to 26.3%, extraction needs to 20.7%, and prosthetic treatment needs to 24.2%.[33] The uniformly high need for restorative and prosthetic treatment across several studies

points towards an emerging pattern of neglect or lack of appropriate dental care seeking among transgender people.

Referrals:

After completion of the oral health assessments, all transgender respondents were given referral cards with a 20% discount on specified dental procedures, which could be availed at the KLE VK Institute of Dental Sciences or satellite centres attached to it under the Department of Public Health Dentistry. This was done with the purpose of ensuring follow-up care within timely limits and gaining access to necessary dental services within a span of three months. The participants found with oral mucosal lesions were referred straight to KLE Hospital for complete assessment and proper treatment planning to enable early intervention and efficient management of possibly dangerous conditions.

Aside from clinical referrals, all of the participants underwent oral health education stressing the value of good oral hygiene and adopting preventive dental practices. Toothbrushes and toothpaste were provided as a gesture of goodwill and a moral responsibility to all the transgender individuals. Techniques of brushing properly were illustrated, and the participants were motivated to adopt these practices as part of their daily lives. These collaborative efforts sought not only to meet short-term dental requirements but also to equip the transgender population with information and resources for long-term oral health enhancement.

Limitation:

This study is subject to certain limitations owing to its descriptive nature. As the information were gathered at one specific time point, establishing causal relationships between variables is not feasible. This means that while we can see relationships between different aspects, we cannot say for sure which came first or whether one directly led to the other. To better understand these connections, future studies should follow participants over a longer period.

Another limitation is that dental caries was diagnosed only through visual inspection. Since radiographic (X-ray) tools were not used during the fieldwork, some hidden or early-stage dental problems may not have been detected. As a result, the true extent of dental issues in the study group might have been underestimated.

FUTURE SCOPE

There are many scope areas for promoting the oral wellbeing of transgender individuals living in Belagavi district of Karnataka in this research.

Preventive Oral Treatment: There are great possibilities of implementing preventive activities such as scaling and sealant application programs for reducing the cases of dental caries among these individuals. They can be implemented in community-level health programs as a means to offer frequent accessibility to preventive oral treatment to transgenders.

Tobacco Cessation Support: Since tobacco consumption is common in this segment, it requires special schemes to help them quit tobacco. The schemes need to make the risks of tobacco well known, provide support to avoid using tobacco, and institute guidelines to reduce its access.

Interventional and Longitudinal Studies: There is great potential to conduct interventional and longitudinal studies assessing the outcomes of various oral health programs and establishing how oral health outcomes alter over time. These studies would provide valuable information on long-term outcomes of preventive and behavioral health interventions, making it possible for evidence-based oral health promotion models specific to transgender populations to be formulated.

Policy Integration: The findings of this study can help policymakers and public health administrators integrate oral health services into broader health programs for transgender individuals to offer them equal accessibility.

Overall, findings from this study hold strong potential to enhance the oral health of transgender individuals in Belagavi by guiding the development of inclusive, personalized interventions and encouraging continued research in this area.

CONCLUSION

The current study among 600 transgender participants from Belagavi district, Karnataka. The conclusions were:

- Majority of the transgenders belonged to the middle-age group.
- Transgender participants from the Belagavi district in Karnataka exhibited a notably high occurrence of dental caries, along with elevated mean DMFT scores.
- In terms of transwomen and transmen the dental caries, periodontal disease and tobacco usage almost equally distributed.
- A high prevalence of bleeding on probing, LOA, and increased PPD was observed in the transgender participants of Belagavi district.
- Periodontal disease was found to be highly prevalent in this population of transgender individuals of Belagavi district, Karnataka.
- The prevalence of dental trauma was low among the transgender participants.
- Oral hygiene practices, such as toothbrushing, were not up to the recommended standards.
- A considerable portion of the participants reported engaging in harmful habits, including smoking and chewing tobacco.
- A noticeable percentage of participants presented with oral mucosal lesions, with oral submucous fibrosis being the most common, followed by leukoplakia, lichen planus, and erythroplakia. These findings could be attributed to increased tobacco consumption.
- In terms of treatment requirements, most of the participants needed preventive or routine dental treatment like scaling and restorations. Some needed urgent treatment, while very few transgender individuals needed no treatment.

- The study findings emphasize the need to address oral health education, introduce preventive dental care measures, and carry out longitudinal studies among transgender individuals in Belagavi district, Karnataka, as a matter of priority.

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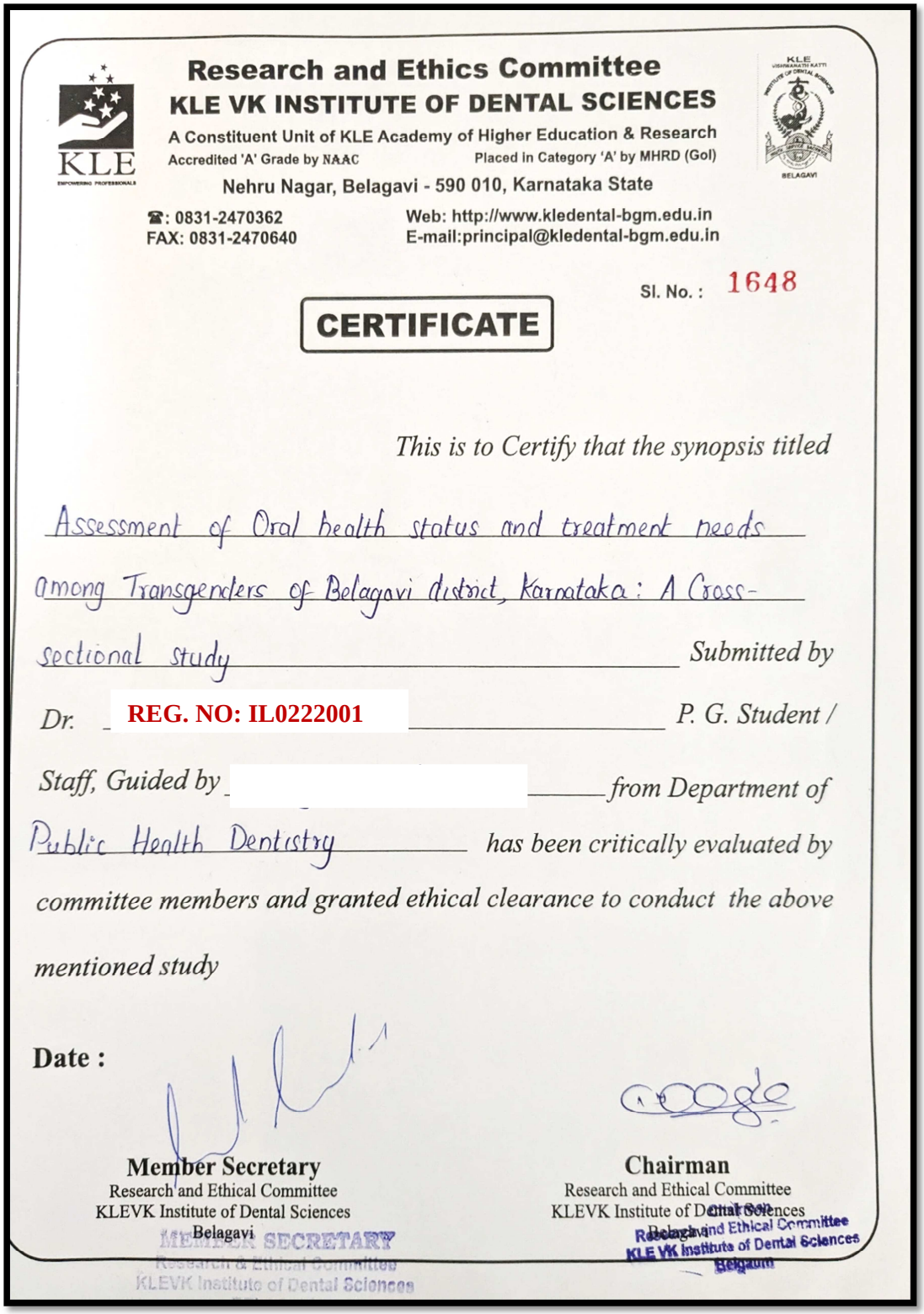
ANNEXURES I – ETHICAL CLEARANCE



Research and Ethics Committee
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Sl. No. : 1648

CERTIFICATE

This is to Certify that the synopsis titled

Assessment of Oral health status and treatment needs among Transgenders of Belagavi district, Karnataka : A Cross-sectional study *Submitted by*

Dr. REG. NO: IL0222001 *P. G. Student / Staff, Guided by* _____ *from Department of* Public Health Dentistry *has been critically evaluated by committee members and granted ethical clearance to conduct the above mentioned study*

Date :

Member Secretary
Research and Ethical Committee
KLEVK Institute of Dental Sciences
Belagavi

MEMBER SECRETARY
Research & Ethical Committee
KLEVK Institute of Dental Sciences

Chairman
Research and Ethical Committee
KLEVK Institute of Dental Sciences
Belagavi

Research and Ethical Committee
KLE VK Institute of Dental Sciences
Belgaum

ANNEXURE II - CONSENT FORM

Date:

I, REG. NO: IL0222001 asking for your volunteered participation in my study entitled "Assessment of Oral Health Status and Treatment Needs among Transgenders in Belagavi District, Karnataka: A Cross-Sectional Study" The maximum time required for oral examination will not be more than 20 minutes and questions will be asked about your personal and oral hygiene habits. Your confidentiality will be maintained. If you have any questions about this study, feel free to contact.

Primary Investigator: REG. NO: IL0222001 (Dental postgraduate student), KAHER'S KLE V.K. Institute of Dental Sciences, Belagavi.

Voluntary participation: Participation in the study is completely voluntary. If you decide not to participate, there will be no negative consequences. Kindly be aware that if you decide to participate, you may stop participating at any given point of time, and you may decide not to answer any specific question.

By signing this form, I am attesting that I have read and understood the information above and I freely give my consent/assent.

(Signature) Witness:

(Signature)

ಒಪ್ಪಿಗೆ ಪತ್ರ

ಕಾಹೇರ್ಸ್ ಕೆಎಲ್ ಇ ವಿ.ಕೆ. ಇನ್ಸ್ಟಿಟ್ಯೂಟ್ ಆಫ್ ಡೆಂಟಲ್ ಸೈನ್ಸಸ್

ಸಾರ್ವಜನಿಕ ಆರೋಗ್ಯ ದಂತವೈದ್ಯ ಇಲಾಖೆ

ದಿನಾಂಕ:

ನಾನು, REG. NO: IL0222001 "ಕರ್ನಾಟಕದ ಬೆಳಗಾವಿ ಜಿಲ್ಲೆಯ ಮಂಗಳಮುಖಿರಲ್ಲಿ ಬಾಯಿಯ ಆರೋಗ್ಯ ಸ್ಥಿತಿ ಮತ್ತು ಚಿಕಿತ್ಸೆಯ ಅಗತ್ಯಗಳ ಮೌಲ್ಯಮಾಪನ: ಒಂದು ಅಡ್ಡ-ವಿಭಾಗದ ಅಧ್ಯಯನ" ಎಂಬ ಶೀರ್ಷಿಕೆಯ ನನ್ನ ಅಧ್ಯಯನದಲ್ಲಿ ನಿಮ್ಮ ಸ್ವಯಂಪ್ರೇರಿತ ಭಾಗವಹಿಸುವಿಕೆಯನ್ನು ಕೇಳುತ್ತಿದ್ದೇನೆ. ಮೌಖಿಕ ಪರೀಕ್ಷೆಗೆ ಗರಿಷ್ಠ ಸಮಯ ಬೇಕಾಗುವುದಿಲ್ಲ 20 ನಿಮಿಷಗಳು ಮತ್ತು ನಿಮ್ಮ ವೈಯಕ್ತಿಕ ಮತ್ತು ಮೌಖಿಕ ನೈರ್ಮಲ್ಯ ಅಭ್ಯಾಸಗಳ ಬಗ್ಗೆ ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲಾಗುತ್ತದೆ. ನಿಮ್ಮ ಗೌಪ್ಯತೆಯನ್ನು ಕಾಪಾಡಿಕೊಳ್ಳಲಾಗುವುದು. ಈ ಅಧ್ಯಯನದ ಕುರಿತು ನೀವು ಯಾವುದೇ ಪ್ರಶ್ನೆಗಳನ್ನು ಹೊಂದಿದ್ದರೆ, ಸಂಪರ್ಕಿಸಲು ಮುಕ್ತವಾಗಿರಿ.

ಪ್ರಾಥಮಿಕ ತನಿಖಾಧಿಕಾರಿ: REG. NO: IL0222001 (ದಂತ ವೈದ್ಯಕೀಯ ಸ್ನಾತಕೋತ್ತರ ವಿದ್ಯಾರ್ಥಿನಿ), ಕಾಹೇರ್ಸ್ ಕೆಎಲ್ ಇ ವಿ.ಕೆ.ಇನ್ಸ್ಟಿಟ್ಯೂಟ್ ಆಫ್ ಡೆಂಟಲ್ ಸೈನ್ಸಸ್, ಬೆಳಗಾವಿ.

ಸ್ವಯಂಪ್ರೇರಿತ ಭಾಗವಹಿಸುವಿಕೆ: ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸುವಿಕೆಯು ಸಂಪೂರ್ಣವಾಗಿ ಸ್ವಯಂಪ್ರೇರಿತವಾಗಿದೆ. ನೀವು ಭಾಗವಹಿಸದಿರಲು ನಿರ್ಧರಿಸಿದರೆ, ಯಾವುದೇ ಋಣಾತ್ಮಕ ಪರಿಣಾಮಗಳಿಲ್ಲ. ನೀವು ಭಾಗವಹಿಸಲು ನಿರ್ಧರಿಸಿದರೆ, ನೀವು ಯಾವುದೇ ನಿರ್ದಿಷ್ಟ ಸಮಯದಲ್ಲಿ ಭಾಗವಹಿಸುವುದನ್ನು ನಿಲ್ಲಿಸಬಹುದು ಮತ್ತು ಯಾವುದೇ ನಿರ್ದಿಷ್ಟ ಪ್ರಶ್ನೆಗೆ ಉತ್ತರಿಸದಿರಲು ನೀವು ನಿರ್ಧರಿಸಬಹುದು ಎಂಬುದನ್ನು ದಯವಿಟ್ಟು ತಿಳಿದಿರಲಿ.

ಈ ಫಾರ್ಮ್‌ಗೆ ಸಹಿ ಮಾಡುವ ಮೂಲಕ, ನಾನು ಮೇಲಿನ ಮಾಹಿತಿಯನ್ನು ಓದಿದ್ದೇನೆ ಮತ್ತು ಅರ್ಥಮಾಡಿಕೊಂಡಿದ್ದೇನೆ ಮತ್ತು ನನ್ನ ಒಪ್ಪಿಗೆ/ಸಮ್ಮತಿಯನ್ನು ಮುಕ್ತವಾಗಿ ನೀಡುತ್ತೇನೆ ಎಂದು ನಾನು ದೃಢೀಕರಿಸುತ್ತೇನೆ.

(ಸಹಿ) ಸಾಕ್ಷಿ:

(ಸಹಿ)

संमती पत्र

मी, REG. NO: IL0222001 या शीर्षकाच्या माझ्या अभ्यासात तुमचा स्वेच्छेने सहभाग मागतो, "कर्नाटकातील बेळगावी जिल्ह्यातील ट्रान्सजेंडर लोकसंख्येमधील मौखिक आरोग्य स्थिती आणि उपचारांच्या गरजांचे मूल्यांकन: एक क्रॉस-सेक्शनल स्टडी". तोंडी तपासणीसाठी लागणारा जास्तीत जास्त वेळ 20 मिनिटांपेक्षा जास्त नसेल आणि तुमच्या वैयक्तिक आणि तोंडी स्वच्छतेच्या सवयींबद्दल प्रश्न विचारले जातील. तुमची गोपनीयता नेहमीच राखली जाईल. या अभ्यासाबद्दल तुम्हाला काही प्रश्न असल्यास, मोकळ्या मनाने संपर्क साधा. कृपया लक्षात ठेवा की तुम्ही सहभागी होण्याचा निर्णय घेतल्यास, तुम्ही तुमचा सहभाग कधीही मागे घेऊ शकता आणि तुम्ही कोणत्याही विशिष्ट प्रश्नाचे उत्तर न देण्याचा निर्णय घेऊ शकता.

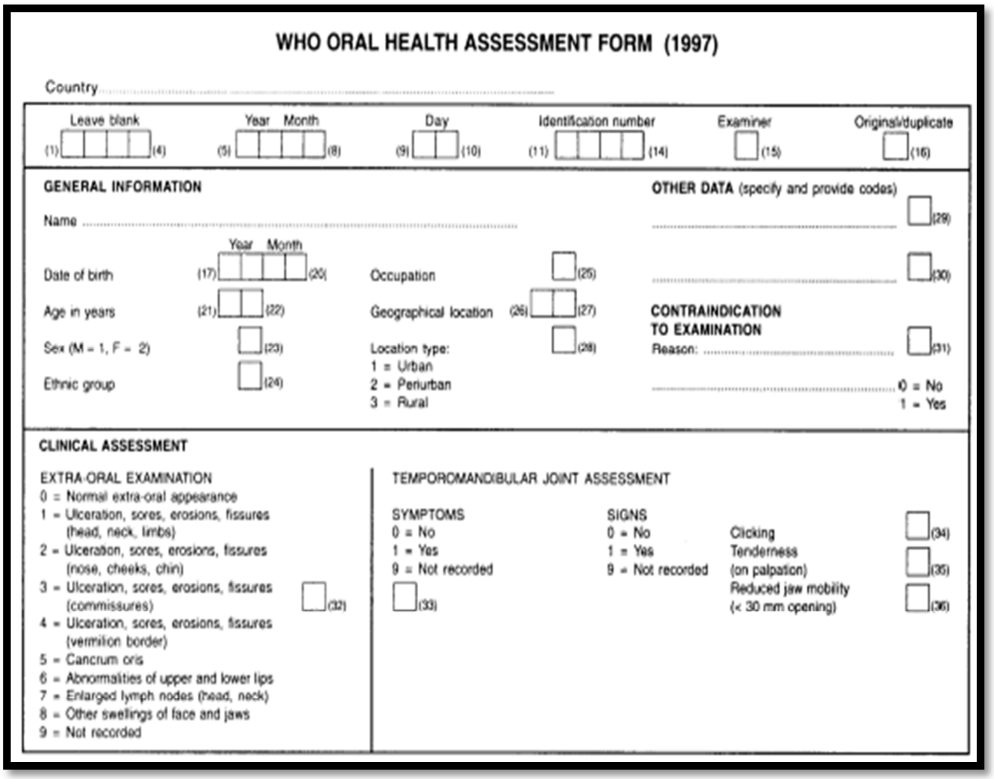
प्राथमिक तपासक: REG. NO: IL0222001

ऐच्छिक सहभाग: अभ्यासातील सहभाग पूर्णपणे ऐच्छिक आहे. तुम्ही सहभागी न होण्याचा निर्णय घेतल्यास, तुमच्या निर्णयामुळे कोणतेही नकारात्मक परिणाम होणार नाहीत. या फॉर्मवर स्वाक्षरी करून, मी प्रमाणित करत आहे की मी वरील माहिती वाचली आणि समजली आहे आणि मी मुक्तपणे माझी संमती देतो/देते.

(स्वाक्षरी) साक्षीदार:

(स्वाक्षरी)

ANNEXURE III - WHO ORAL HEALTH ASSESSMENT FORM 1997



WHO ORAL HEALTH ASSESSMENT FORM (1997)

Country .....

Leave blank (1)(4) | Year Month (5)(8) | Day (9)(10) | Identification number (11)(14) | Examiner (15) | Original/duplicate (16)

GENERAL INFORMATION

Name .....

Date of birth (Year Month) (17)(20)

Age in years (21)(22)

Sex (M = 1, F = 2) (23)

Ethnic group (24)

Occupation (25)

Geographical location (26)(27)

Location type: (28)
1 = Urban
2 = Periurban
3 = Rural

OTHER DATA (specify and provide codes) (29)

(30)

CONTRAINDICATION TO EXAMINATION
Reason: ..... (31)

0 = No
1 = Yes

CLINICAL ASSESSMENT

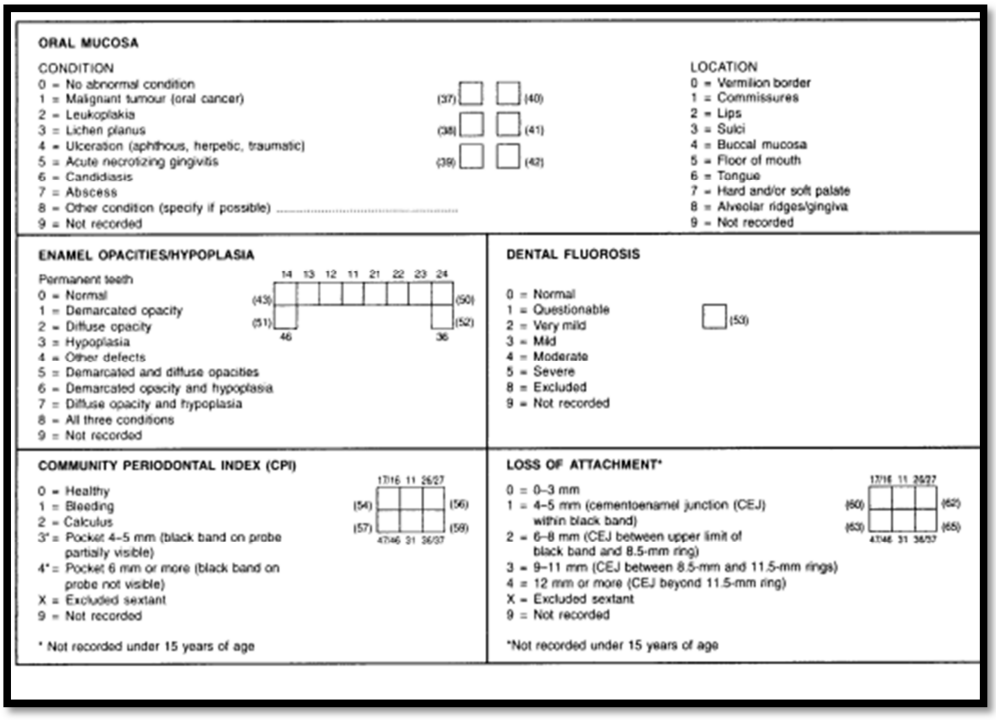
EXTRA-ORAL EXAMINATION (32)
0 = Normal extra-oral appearance
1 = Ulceration, sores, erosions, fissures (head, neck, limbs)
2 = Ulceration, sores, erosions, fissures (nose, cheeks, chin)
3 = Ulceration, sores, erosions, fissures (commissures)
4 = Ulceration, sores, erosions, fissures (vermilion border)
5 = Cancrum oris
6 = Abnormalities of upper and lower lips
7 = Enlarged lymph nodes (head, neck)
8 = Other swellings of face and jaws
9 = Not recorded

TEMPOROMANDIBULAR JOINT ASSESSMENT

SYMPTOMS (33)
0 = No
1 = Yes
9 = Not recorded

SIGNS
0 = No
1 = Yes
9 = Not recorded

Clicking (34)
Tenderness (on palpation) (35)
Reduced jaw mobility (< 30 mm opening) (36)



ORAL MUCOSA

CONDITION (37)(40) (38)(41) (39)(42)
0 = No abnormal condition
1 = Malignant tumour (oral cancer)
2 = Leukoplakia
3 = Lichen planus
4 = Ulceration (aphthous, herpetic, traumatic)
5 = Acute necrotizing gingivitis
6 = Candidiasis
7 = Abscess
8 = Other condition (specify if possible) .....
9 = Not recorded

LOCATION
0 = Vermilion border
1 = Commissures
2 = Lips
3 = Sulci
4 = Buccal mucosa
5 = Floor of mouth
6 = Tongue
7 = Hard and/or soft palate
8 = Alveolar ridges/gingiva
9 = Not recorded

ENAMEL OPACITIES/HYPOPLASIA

Permanent teeth
0 = Normal
1 = Demarcated opacity
2 = Diffuse opacity
3 = Hypoplasia
4 = Other defects
5 = Demarcated and diffuse opacities
6 = Demarcated opacity and hypoplasia
7 = Diffuse opacity and hypoplasia
8 = All three conditions
9 = Not recorded

14 13 12 11 21 22 23 24 (43)(50) (51)(52) 46 36

DENTAL FLUOROSIS

(53)

0 = Normal
1 = Questionable
2 = Very mild
3 = Mild
4 = Moderate
5 = Severe
8 = Excluded
9 = Not recorded

COMMUNITY PERIODONTAL INDEX (CPI)

0 = Healthy
1 = Bleeding
2 = Calculus
3* = Pocket 4–5 mm (black band on probe partially visible)
4* = Pocket 6 mm or more (black band on probe not visible)
X = Excluded sextant
9 = Not recorded

* Not recorded under 15 years of age

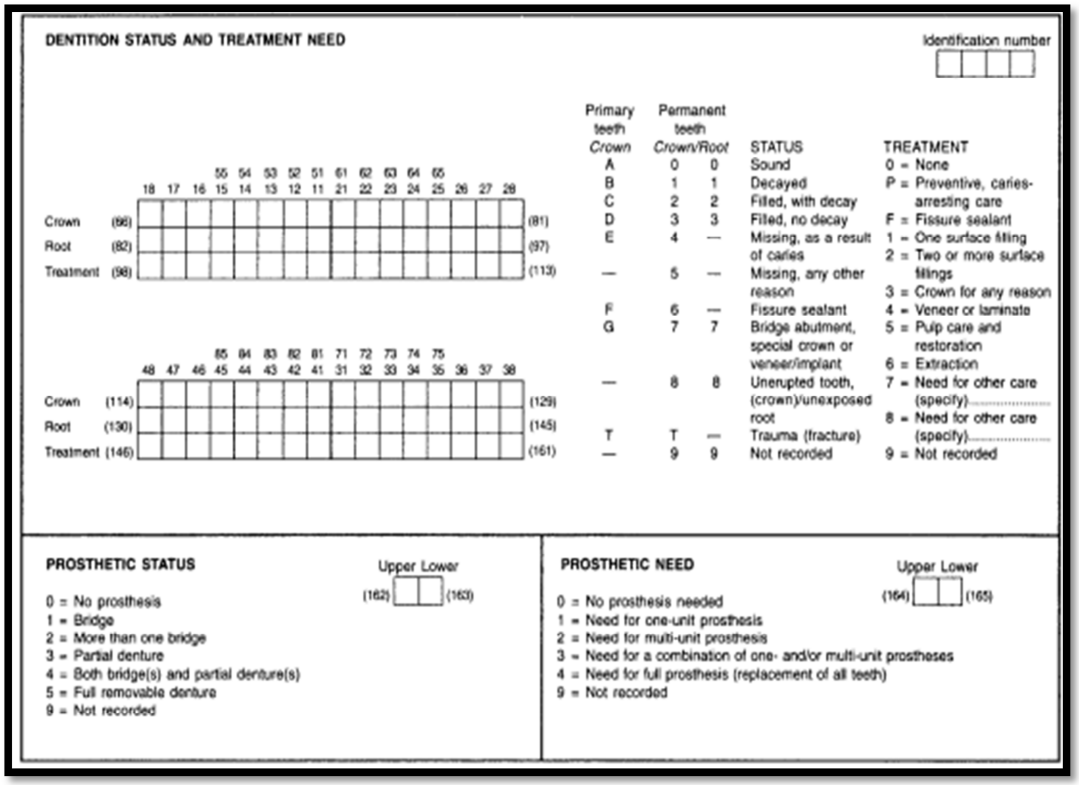
17/16 11 26/27 (54)(56) (57)(59) 47/46 31 36/37

LOSS OF ATTACHMENT*

0 = 0–3 mm
1 = 4–5 mm (cementoenamel junction (CEJ) within black band)
2 = 6–8 mm (CEJ between upper limit of black band and 8.5-mm ring)
3 = 9–11 mm (CEJ between 8.5-mm and 11.5-mm rings)
4 = 12 mm or more (CEJ beyond 11.5-mm ring)
X = Excluded sextant
9 = Not recorded

*Not recorded under 15 years of age

17/16 11 26/27 (60)(62) (63)(65) 47/46 31 36/37



DENTITION STATUS AND TREATMENT NEED

Identification number

Primary teeth *Crown*	Permanent teeth *Crown*	Permanent teeth *Root*	STATUS	TREATMENT
A	0	0	Sound	0 = None
B	1	1	Decayed	P = Preventive, caries-arresting care
C	2	2	Filled, with decay	F = Fissure sealant
D	3	3	Filled, no decay	1 = One surface filling
E	4	—	Missing, as a result of caries	2 = Two or more surface fillings
—	5	—	Missing, any other reason	3 = Crown for any reason
F	6	—	Fissure sealant	4 = Veneer or laminate
G	7	7	Bridge abutment, special crown or veneer/implant	5 = Pulp care and restoration
				6 = Extraction
—	8	8	Unerupted tooth, (crown)/unexposed root	7 = Need for other care (specify).....
				8 = Need for other care (specify).....
T	T	—	Trauma (fracture)	
—	9	9	Not recorded	9 = Not recorded

18 17 16 15 14 13 12 11 21 22 23 24 25 26 27 28

Crown (66) (81)
Root (82) (97)
Treatment (98) (113)

48 47 46 45 44 43 42 41 31 32 33 34 35 36 37 38

Crown (114) (129)
Root (130) (145)
Treatment (146) (161)

PROSTHETIC STATUS

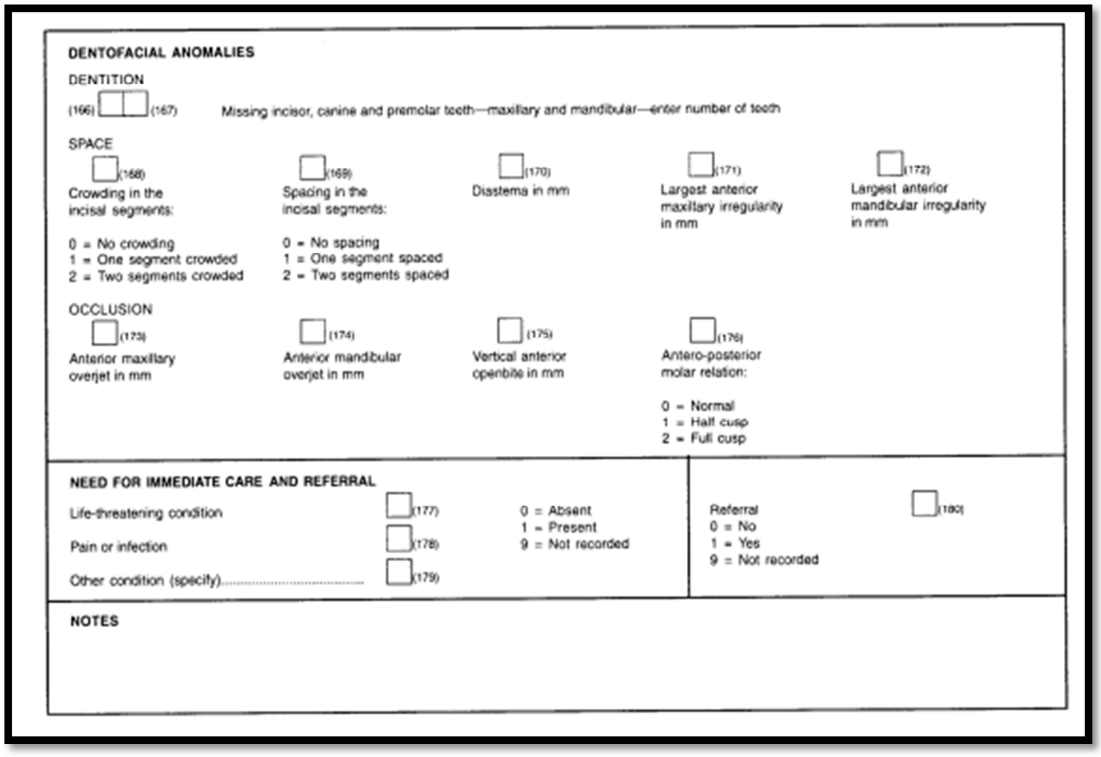
Upper Lower (162) (163)

0 = No prosthesis
1 = Bridge
2 = More than one bridge
3 = Partial denture
4 = Both bridge(s) and partial denture(s)
5 = Full removable denture
9 = Not recorded

PROSTHETIC NEED

Upper Lower (164) (165)

0 = No prosthesis needed
1 = Need for one-unit prosthesis
2 = Need for multi-unit prosthesis
3 = Need for a combination of one- and/or multi-unit prostheses
4 = Need for full prosthesis (replacement of all teeth)
9 = Not recorded



DENTOFACIAL ANOMALIES

DENTITION

(166) (167) Missing incisor, canine and premolar teeth—maxillary and mandibular—enter number of teeth

SPACE

(168) Crowding in the incisal segments:
0 = No crowding
1 = One segment crowded
2 = Two segments crowded

(169) Spacing in the incisal segments:
0 = No spacing
1 = One segment spaced
2 = Two segments spaced

(170) Diastema in mm

(171) Largest anterior maxillary irregularity in mm

(172) Largest anterior mandibular irregularity in mm

OCCLUSION

(173) Anterior maxillary overjet in mm

(174) Anterior mandibular overjet in mm

(175) Vertical anterior openbite in mm

(176) Antero-posterior molar relation:
0 = Normal
1 = Half cusp
2 = Full cusp

NEED FOR IMMEDIATE CARE AND REFERRAL

Life-threatening condition (177)
Pain or infection (178)
Other condition (specify)..... (179)

0 = Absent
1 = Present
9 = Not recorded

Referral (180)
0 = No
1 = Yes
9 = Not recorded

NOTES