ASSESSMENT OF ORAL HEALTH STATUS AND TREATMENT NEEDS OF COMMUNITY HEALTH WORKERS OF BELAGAVI DISTRICT: A CROSS-SECTIONAL STUDY

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LIST OF ABBREVIATION

Sl. No.	Abbreviation	Expanded form
1.	WHO	World Health Organisation
2.	CHW	Community Health Workers
3.	ANM	Auxiliary Nurse Midwives
4.	AWW	Anganwadi workers
5.	ASHA	Accredited Social Health Activist
6.	DMFT	Decayed-Missing-Filled-Teeth
7.	DT	Decayed Teeth
8.	MT	Missing Teeth
9.	FT	Filled Teeth
10.	BOP	Bleeding on Probing
11.	LOA	Loss of Attachment
12.	PPD	Periodontal Pocket Depth
13.	PHC	Primary Health Centre
14.	CHC	Community Health Centre
15.	STROBE	Strengthening the Reporting of Observational Studies in Epidemiology
16.	CPI	Community Periodontal Index
17.	ICDS	Integrated Child Development Scheme

ABSTRACT

Background: Community Health workers, such as Auxiliary Nurse Midwives (ANM), Accredited Social Health Activist (ASHA) and Anganwadi workers (AWW) are the interconnection between the healthcare system and the community. They have been deployed in various health programmes ranging from child and maternal health to chronic diseases.

Aim: Assessment of oral health status and treatment needs among the Community health workers of Belagavi district.

Methods: A descriptive cross-sectional study conducted for 6 months from January 2024 to June 2024 according to STROBE guidelines. The study included 729 Community Health workers working in Primary Health Centres and Anganwadi centres in Belagavi district who were recruited using two stage random sampling. Data collection was performed using WHO oral health proforma was employed to assess the oral hygiene and deleterious habits among the study participants. The principal investigator was trained to ensure consistency of the findings. The examination was carried out by strictly adhering to protocols for infection control and proper setting of the study. Tests like Chi-square test and Kruskal-wallis test were performed. The significance level was set at $p \leq 0.05$.

Results: The overall caries prevalence of dental caries was found to be 86.1%. The DMFT score was found the highest among the oldest age group of > 50 years (15.04 ± 1.78) and the lowest among the youngest age group of < 30 years (8.70 ± 4.94). Age group wise comparison showed significant difference in DMFT, MT and FT scores while no difference was observed between various types of Community Health workers. The overall prevalence of Bleeding on Probing, Periodontal Pocket Depth

and Loss of Attachment was found to be 66.1%, 19.6% and 47.9% respectively. Oral mucosal lesions were observed in 4.1% of the study participants. The treatment need of filling was reported more than extraction and pulpal therapy while prosthetic need was highest among the oldest age group of > 50 years. Majority of the participants reported suboptimal oral hygiene practices like brushing habits and dental visit while a less portion (13.3%) of them had the habit of tobacco chewing. Sugar consumption was found to be high in the study population with tea and sugar being the most frequently consumed beverages. Altogether, the study underscored the divergences existing in the oral health outcomes of the study participants.

Conclusion: A high proportion of decayed tooth was seen among the study participants with higher prevalence among the oldest age group. The prevalence of gum diseases was high while oral mucosal lesions, dental fluorosis and dental trauma had low prevalence. The treatment needs varied in different the age group with maximum prosthetic need among the oldest age group. These findings suggested the requirement of regular dental checkups and preventive strategies along with early diagnosis and prompt treatment of dental diseases targeting among the Community Health workers.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PHOTOGRAPHS

INTRODUCTION

"The essence of global health equity is the idea that something so precious as health might be viewed as a right." -Paul Farmer

Oral health is a multifaceted concept which encompasses numerous entities like social, emotional, physical and psychological factors that is inevitable for overall health and well-being.[1] It is an important entity that facilitates functions like mastication, speech and socialising without pain, discomfort or embarrassment. Oral health goes hand-in hand with general health. Oral-systemic health relationship is complex and bidirectional. [2] Although being an indispensable component of healthy life, oral health is often neglected resulting in oral diseases. [3]

Oral diseases are major global health crises with leaping prevalence especially developing countries. [4,5] In 2022, the World Health Organisation reported 3.5 billion people have been afflicted by oral disease accounting for almost half the global population. Undetected and untreated tooth decay, gum disease and cancers are the key oral health issues contributing to this burden. The World Health Organisation has even described caries and gum disease as pandemic affecting the community irrespective of their age, gender and socioeconomic status. [6] When it comes to Indian scenario, dental caries and periodontal disease accounts upto 54.16% and 51% respectively. [7,8] This widespread occurrence of oral diseases across various age groups has contributed to numerous negative health outcomes, such as sleep disturbances, social withdrawal, pain, discomfort, fear, anxiety, and difficulties in everyday functioning. [9]

These dental diseases can be prevented if they are diagnosed and treated at initial stages. [3] Dental services should be made universally reachable to all individuals

across the nation, including those in the most remote regions. However, it is evident that these oral diseases affect the community inordinately showing increased prevalence among impecunious population. [10] This remarkable socio-economic gradient being an impediment demands a radically newer approach and policies for oral health delivery. [3]

In 1986, the Indian Dental Association enforced the National Oral Health Policy. Since then, various programmes have been deployed to promote comprehensive oral health services. [11] Despite extensive efforts by policymakers and stakeholders, substantial barriers persist perpetuating health inequalities. [12] Amalgamation of dental health into primary health care encompassing preventive approaches, comprehensive care and promotion can bridge the existing disparity. [13] Even the World Health Organisation has insisted its constituent states to coalesce oral health with the existing primary health infrastructure so that oral health services are dispensed to the downtrodden and underprivileged people of the community. [14]

In India, Primary health care is rendered through Primary Health centres (PHC) and the Community Health Workers (CHW) act as preliminary point of engagement addressing the needs of the community. [15,16] According to the World Health Organisation, "Community health Workers (CHWs) are health care providers who live in the community they serve and receive lower levels of formal education and training than professional health care Workers such as nurses and doctors. This human resource group has enormous potential to extend health care services to vulnerable populations, such as communities living in remote areas and historically marginalized people, to meet unmet health needs in a culturally appropriate manner, improve access to services, address inequities in health status and improve health system performance and efficiency."[17]

In India, there are approximately 13 lakhs Anganwadi Workers,[18] 10 lakhs ASHA [19] and 8 lakhs ANM [20] deployed in primary health care forming an integral component of health infrastructure of the country. [21] They have already been deployed in many national health programs and exhibited appreciable outcomes. [22] This suggests that these Community Health Workers can be deployed in regions which lacks dental workforce thereby integrating oral health in primary health care system. [15]

Evidences show that oral health awareness is positively correlated with oral health status. [23] This implies that dental status of CHW can reflect their awareness, practices and their preventive care-seeking behaviour regarding dental health. [21] Few studies reported poor oral health among these Workers owing to their insufficient understanding and misconceptions on oral health. [24] However, there is a notable lack of research addressing the specific dental challenges and treatment requirements of this population in Belagavi district hampering the development of effective dental care programs, potentially leading to inefficient resource allocation and suboptimal public health strategies. Therefore, this research aims to evaluate the "Oral Health Status and Treatment Needs" among CHW in Belagavi district.

AIMS AND OBJECTIVES

Aim:

Assessment of oral health status and treatment needs of Community Health Workers of Belagavi district.

Objectives:

- To assess the oral health status and treatment needs among Community Health Workers of Belagavi district.
- To assess their oral hygiene and deleterious habits.
- To assess the oral health status and treatment needs, oral hygiene and deleterious habits among Community Health Workers based on age groups.

REVIEW OF LITERATURE

1. A systematic review by Singh et al. (2025) to assess the knowledge of ASHA Workers about various diseases. 73% of the them had knowledge on oral health, oral hygiene and oral cancer. This knowledge varied on the basis of education, years of working, training program exposure and the region they live. These grassroot Workers being integral part of the healthcare system of India should be focussed and empowered on the aspects where they lack knowledge and awareness for better delivery of health services. [25]
2. A scoping review by Molete et al. (2024) to analyse the importance of CHW in promotion of oral health among school children. This article suggested that these CHW were stationed for various services such as screening of dental disease and teaching the people about dental hygiene. It accentuated the efficiency of a non-dental personnel in oral health promotion. [26]
3. Davis et al. (2024) evaluated the knowledge and awareness among the ASHA Workers of Thrissur district on Oral cancer and oral potentially malignant lesions. 150 ASHA Workers participated in the questionnaire study out of 82.3% were aware about oral cancer and oral potentially malignant lesions. However, only 17% of these health Workers had approached dentists. It was suggested that empowering the ASHA Workers for screening of lesions can be an appropriate approach to decrease oral cancer burden of the country. [27]
4. Knowledge and attitude of ASHA workers on early childhood caries by Cheruthottathil et al. (2023) found out that 55.76% of the study participants had good knowledge. Also, their knowledge was poor regarding first dental visit and oral hygiene practices of children. The overall knowledge is satisfactory while they had better attitude which was suggestive of the idea that training these

Workers can be effective in creating awareness among the community about the importance of oral health. [28]

5. Thampi et al. (2022) evaluated the feasibility of training CHW for incorporating a cancer detecting mobile application found that sensitivity of screening by community health Workers was found to be 96.7% suggesting they can be deployed in screening of oral cancer after training under dental professionals. Also, a newer approach like integration of such technology-based screening technique can boost up the efficiency of disease detection and create awareness in the community. [29]
6. A study was undertaken by Khot et al (2022) to evaluate the knowledge and attitude of ASHA and Anganwadi workers on tobacco control in Belagavi city. The study included 220 participants through simple random sampling. It can be witnessed ASHA Workers had better knowledge and attitude than Anganwadi Workers. Also, ASHA Workers had contributed on spreading awareness about tobacco while Anganwadi Workers did not take much initiative on this aspect. This implores that need for training programmes for these community health Workers on tobacco and its ill effects on oral health. [30]
7. Uptake of dental services by ASHA and Anganwadi Workers in Lucknow was accounted by Khoisnam et al. (2022) A total of 500 participants enrolled in the study out of which only 30% of them have received dental treatment. It was observed that 32% had caries, 8% had periodontal disease while 56% had both dental caries and periodontal diseases. It also suggested that dental services acquired by these primary healthcare Workers rely upon various demographic factors like age, occupation and the existing oral diseases. [21]

8. Garg et al. (2022) carried out a survey on awareness about role of health literacy and self-efficacy in quitting tobacco among primary health Workers in Uttar Pradesh. It suggested that most of them were aware about negative impact of tobacco on health. However, they were not aware about the role of health literacy and self-efficacy in quitting tobacco and have not attended any training modules on quitting tobacco. Also, it was observed that Anganwadi Workers had better awareness when compared to the other primary healthcare Workers suggesting that training them on tobacco cessation would be efficient strategy for creating awareness in the community. [31]
9. Mixed-method research performed by Birje et al. (2022) among tribal women in in Maharashtra to ascertain the turmoil in carrying out screening programme for non-communicable diseases and oral cancers. 9 ASHA Workers were included in the focus group discussion and it was emphasized that ASHA worker were indispensable for connecting the community with country's health infrastructure. As they belong to the community, they can understand the cultural norms of the people and hence can effectively carry out oral health promotion. [32]
10. Satyarup et al. (2021) evaluated the impact of coaching AWW on oral hygiene of school children. It concluded that there is improvement in terms of oral hygiene practices like usage of fluoridated toothpaste, cleaning of teeth after meals and dietary habits of the children like reduced consumption of sugary food. Also, it was observed that there was reduction of gingival index scores after the intervention. These findings implore the appropriateness of community health Workers for creating awareness on oral health among school children. [33]
11. A mixed method study by Malhotra et al. (2021) explored perceptions of government officials on integrating dental health in government health schemes. It included Community Health Workers, dentist and medical Workers.

Assessment of perceptions was done using a questionnaire followed by Focus group discussions which included seven members. Majority of Community Health Workers accepted that screening for oral diseases should be added in their regular practice. However, various factors like increase work load, lack of training and insufficient pay were put forward as obstacles faced by them in this aspect.[34]

12. Khanna et. al. (2021) checked the competence of trainning module for ASHA and Anganwadi Workers on dental caries and caries activity. Training was done using visual aids and live demonstrations and it was found that there was betterment dental habits and caries activity of the children after intervention. This underscores the empowerment of these Workers in educating the mothers and wards on dental health. [35]
13. Godhi et. al. (2021) ascertained the Community Health Workers for knowledge on early childhood caries. The study included 438 participants and overall knowledge of the study population was found to be less insisting upon the need for implementing training programme for these Workers on oral health and its role in proper nutrition of children. [36]
14. Chaturvedi et. al. (2021) analysed health Workers of Udaipur to evaluate dental status. It concluded that majority of the study participants had dental caries while smaller proportion of them had root stumps and grossly decayed teeth. Attrition was observed in maximum of them. These findings were attributed to dental health habits and eating routine of the study participants This data can act as a milestone for the stakeholders to implement dental checkup and educational programmes inclusive of health Workers. [37]
15. Divyalalitha at. al. (2020) evaluated effectiveness of a dental traning programme among AWW and parents on the dental outcomes of children. 511 participants

were enrolled in the study and the study was conducted for a period of one year. A drastic improvement was seen dental status in the children after the training programme suggesting that integration of a dental teaching module and dental checkups to the existing Integrated Child Development Scheme can be an effective strategy for improving the oral health of children. [38]

16. Bhagia et. al. (2020) carried out an interventional study among the Community health Workers in Delhi to compare various techniques on improving dental health knowledge. The study included 301 participants who categorised into 4 groups based on the intervention such as conventional methods, printed materials, virtual presentation and combination of all. The study concluded that the combination method was better in improved outcomes and thereby providing a platform for health education for these Community Health Workers by dental professionals. [39]
17. Cherian et. al. (2019) conducted an interventional study on the effectiveness of training Anganwadi Workers about oral health for about 3 months and the knowledge and practice was evaluated using a set of questions. An increase in oral health knowledge and practice of the study participants after the intervention was noted. This highlights the importance of empowering these community healthcare Workers for oral health services such as dental health intervention, early detection and prompt treatment of dental diseases. The study also suggested integrating regular oral health checkups in the Anganwadi centres. [40]
18. Sajjanshetty et. al. (2019) estimated dental status of Auxiliary health Workers in Mangalore. Maximum of them had good oral knowledge and practice. The caries prevalence was found to be 67.1% Calculus was seen in majority of the participants while comparatively lower prevalence of LOA was noticed. About 22% of them had not reported for a dental checkup. All these findings

underscores that dental health education and dental checkup camp should be conducted to address the issues existing in non-utilization of dental services by the population. [41]

19. Batra et. al. (2018) checked the feasibility of integrating dental in primary health care by motivational interviewing of mothers by ASHA. The study included 3 primary health centres in Uttarakhand which were randomly assigned to study group, conventional group and control group. 60 mother of children aged 8-12 months participated in the study. The ASHA underwent training for interviewing the mother's outlook about factors associated with early children caries. Two group received their respective interventions while no education was given to the control group. Dental outcomes of the offsprings and motivational interviewing group exhibited better results. These findings highlight the feasibility of motivational interviewing by ASHA as an effective medium for propogation. [42]
20. Fotedar et. al. (2018) used a questionnaire among CHW to assess their oral health outlook. The study was conducted in Shimla and included 130 participants. Maximum of them used tooth brush, paste for oral hygiene and brushed twice a day. The knowledge of the participants varies according to age and education with better knowledge among younger and well-educated participants. These findings reinforce the importance of educating them on dental health so as to conduct effective dental screenings in the community. [15]
21. Vinnakota et. al. (2017) analysed the outlook on dental health among ASHA in Guntur district. 275 participants were recruited reporting less knowledge. Majority of the participants came across people coming up dental complaints but only a small portion refer them to dental professionals. All these findings accentuate the need for educating the CHW on the dental health thereby ensuring proper education of community by these primary health Workers. [43]

22. Prusty et. al. (2017) quantified the outlook of ASHA and ANM on dental health in Assam and a total of 206 participants were recruited. A set of questions were used to assess them and they had poor knowledge insisting an education among them. CHW being an interface between the healthcare and community, they play a vital role in creating awareness in the community. [44]
23. A study conducted by Habbu and Krishappa (2017) used Communication-behaviour model for an educational intervention among Community Health Workers. 95 CHW were given oral health education using ppt and a pamphlet was given for reinforcement. The participants were evaluated using a set of questions which showed increased scores after intervention when compared to baseline scores suggesting the intervention was effective in instilling knowledge among the Community health Workers. [45]
24. Shwetha et. al. (2016) evaluated the use of dental facilities by CHW in Karnataka. Out of 321 workers, 28.3% had used dental services. Majority of them had tooth decay and gun disease. Oral premalignant lesions were observed in scare portion of the study population. These findings insist to create dental health awareness in the Community Health Workers. [46]
25. Gambhir et. al. (2016) performed a review to evaluate the knowledge about dental health of Anganwadi Workers found that pain was the reason for visiting dentist. Majority of them were not aware about of fluoride containing dentifrices and visit of dentist during pregnancy. Only few studies reported adequate awareness of Anganwadi Workers on dental health. Ultimately, review concluded insufficient knowledge of Anganwadi Workers on oral health highlighting the necessity for further education about oral health. [47]

26. Persai et. al. (2015) checked the feasibility in deploying Community Health Workers to educate the community about the tobacco's negative effect. A total of 512 ASHA from Gujarat and Andhra Pradesh were recruited in the study through systematic random sampling. Most of them knew harmful effects of tobacco. However, majority did not educate the patients regarding the harmful effects of tobacco unless they present with specific illness. These findings implies that training of these primary health Workers on tobacco cessation is essential for the community. [48]
27. Panda et. al. (2015) undertook a research among 501 Auxiliary Nurse Midwives to find out their understanding about impact of tobacco on health. Most of them knew about the harmful effects of tobacco but only a few were aware of its impact on reproductive and child health. A small proportion of them received training related to tobacco and it was observed that majority of the trained ANM provide awareness about tobacco among the community. These findings imply on the need for training the ANM about tobacco cessation. [49]
28. An interventional study by Kakodkar. et. al. (2015) among 50 Anganwadi Workers were enrolled in the study who were assigned to study and control group. The study group received oral health education using booklet while the others had no education. It found improvement in the knowledge in experimental group 1 month after intervention. These findings help to understand that proper training of Community Health Workers can empower them to educate the community. [50]

29. A questionnaire study by M. et. al. (2014) among the AWW on evaluating the knowledge on dental health. Majority of the them knew about various aspects in child's teeth and educated the mother regarding the child's oral health. These findings underscores the indispensability of these CHW on the dental status of children in the community. [51]
30. Sandhya et. al. (2014) assessed the effectiveness of education on improving knowledge of primary health Workers. Intervention was provided by which was reinforced by printed materials. The baseline assessment revealed poor knowledge on oral health among the study participants while a prominent increase in the knowledge of participants after 1 month of intervention. The findings asserts that training of primary health Workers could be a useful strategy for creating awareness among the community. [52]
31. Aggnur et. al. (2014) surveyed health care Workers for dental status and awareness. It was found maximum of them agreed that caries could be caused by eating sugary food. The mean DMFT score was found to be 5.02 while the dental caries was seen in 97.2% of HCWs. Calculus was observed among major portion of the study participants while periodontal pockets were less. Elder group required extraction and it was majorly due to caries. This high prevalence of caries emphasise on conducting dental camps for the health workers. [24]
32. Shakya et. al. (2013) carried out a questionnaire study on AWW on oral health among Mangalore city. It concluded that few were aware about dental caries and almost 60 % of them were aware about the time of eating sweets and received dental awareness from dentist. It was observed a positive attitude among the study participants about oral health suggesting that training these Workers could be an effective measure for improving dental health of children. [53]

33. Raj et. al. (2013) undertaken interventional research to on health education programme among Anganwadi Workers on dental outcomes of children. The study included 534 children from 21 Anganwadi centres. Oral health education including brushing technique and plaque control was provided to the Anganwadi Workers using PowerPoint and they were made to teach the same to mother of children. The follow-up period was three months after data collection was done. The study reported improvement on the dental status of children like plaque score, debris score, caries activity and oral hygiene habits. These findings reinforce the need for training the Anganwadi Workers especially for the betterment of dental health of children. [54]
34. A survey was conducted for evaluating the knowledge of Anganwadi Workers on ECC. The study was carried out in Davangere city which enrolled 74 participants. It was observed that 50% of the study participants knew about the impact of pregnant mother's diet on children's teeth and spread of bacteria from mother to children while majority of them were aware about influence of primary teeth on permanent teeth and importance of breastfeeding on child's health. These findings accentuates the role of Anganwadi Workers in carrying out oral health education programs to create awareness on early childhood caries. [55]
35. Prathibha et. al. (2010) enacted a study on awareness of Anganwadi Workers. The study was conducted among 104 Anganwadi Workers in Karimnagar. It was observed that majority of the study participants used toothbrush and brushed twice daily. However, lesser proportion cleaned their mouth after meal. Considering reason for dental caries, a small portion of the participants were aware about the influence of eating sugar on caries, effect of tooth brushing and a few were not aware. These findings stresses upon planning educational schemes

involving the Community health Workers on oral health so as to create awareness among them. [56]

36. A survey was conducted by Pankaj et. al. (2005) among the Anganwadi Workers of Belagavi city to evaluate knowledge, attitude and practices. The study reported that maximum used tooth brush and paste, brushed twice daily and used plain water to rinse their mouth while a larger proportion had never visited dentist. Considering knowledge and attitude, maximum had medium insights and favourable attitude on oral health. These findings highlight the discrepancy among the AWW thereby necessitating educational interventions among the Community Health Workers. [57]

MATERIALS AND METHODS

Study Design, Duration and Setting

A cross-sectional design which was employed in this study following STROBE guidelines. The study was implemented from January 2024 to June 2024.

Source of data

Community Health Workers working in Anganwadi centres and Primary Health centres (Anganwadi Workers, Accredited Social Health Activists and Auxiliary Nurse Midwives) of Belagavi district were recruited.

Selection Criteria

Inclusion criteria

- Community Health Workers above 18 years given consent for participating in the study were enrolled.

Exclusion criteria

- Participants who were not willing to participate and refuse to give consent were excluded

Ethical Considerations, permissions, and informed Consent

The permission was acquired from ethical committee of the institution (Reference number: 191; Date:16.11.2023) and the study strictly adhered to the standard ethical principles. (Annexure I) Official permissions were obtained from the District Health Officer (Annexure II) and the Deputy director, Department of Women and Child Development, Belagavi district. (Annexure III) Informed consent in local languages were obtained from all the participants before conduct of the study. (Annexure IV)

Sample size calculation

The formula was for sample size was

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

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

p = prevalence (from Parent Article)

q = 1-p

d = Precision

Chaturvedi et al. reported that prevalence of dental caries was 87.5% [37] Using it in the aforementioned formula,

p = 0.875 q = 0.125 d = 4.37

Substituting the values, sample size of *243* per group was required.

Final sample size was summed up to **729**.

Sampling technique

Two stage random sampling technique in which Primary Health centres and Anganwadi centres from all the taluks of Belagavi district were randomly selected and then Community Health Workers were randomly selected.

Organization of data collection

1.Pilot study

30 Community Health Workers were chosen to assess feasibility of the research and identify any possible difficulties.

2. Training and calibration

The principal investigator was trained in Public Health dentistry department by Professor to ensure the assessment is consistent. WHO Oral Health Assessment 1997 was carried out for ten subjects and five of them were randomly recalled for a repeated assessment. Intra-examiner reliability was derived as 0.88 which was considered high.

3. Tools used for data collection

a) WHO Oral Health Assessment Form (1997)

WHO Oral Health Assessment form (1997) adopted from the "Oral Health Survey – Basic Methods 4th Edition" was utilized in the present study. (Annexure V) This assessment gives a comprehensive detail on the dental status of an individual which includes the dentition status as well as the prosthetic status, dental trauma, periodontal status, dental fluorosis and oral mucosal lesions.

b) WHO Oral Health Questionnaire for Adults (2013)

This study employed the WHO Oral Health Questionnaire for Adults (2013) taken from “Oral Health Survey – Basic Methods 5th Edition” (Annexure VI) which was carried out in personal interview method. It is a standard tool which has 16 closed ended multiple choice questions in English. It aids to ascertain the oral hygiene

practices, including the frequency and methods of toothbrushing, as well as the frequency of dental visits. Also, it helped to determine the sugar consumption frequency and deleterious habits like tobacco consumption.

4. Implementation of the survey

a) Scheduling:

The dates of examination were scheduled in accordance with their monthly meetings at respective Primary Health Centres and Anganwadi centres. The examination was carried out in daylight hours mostly in the morning. The location was fixed in prior based on the availability of the participants on the day of their regular monthly meetings.

b) Emergency care and referral:

Participants requiring emergency or additional treatment were appropriately given referral cards for getting the treatment done in the KLE VK dental college, Belagavi.

*c) Personnel and organization**:***

1. Recording clerk:

Five recording clerks were trained to ensure coordination and precision while recording the WHO Oral Health Assessment form.

2. Organizing clerk:

The in-charges of the respective Primary Health Centres and Anganwadi centres supervised the process. They assisted for maintaining the orderly flow of examination.

d) Infection control

Proper infection control protocols were strictly followed which includes use of disposable masks and gloves throughout the examination process. Gloves were changed for each participant to prevent cross infection. A total of 100 set of sterilized instruments were taken for examinations and were sterilized at the end of each day. 25 CPI probes were also taken and cold sterilization was conducted during the examinations to maintain the sterilization protocols.

e) Examination site and duration

The examination site was fixed prior to the day of examination in respective PHCs and Anganwadi centres and all the necessary arrangements were meticulously arranged to facilitate proper operations. 20 minutes was taken for oral examination and interviewing of each participant.

f) Lighting:

The checkup was done under daylight with optimum illumination. In case of requirement of extra illumination, a torch was utilized.

g) Seating of the recording clerk / intern:

The recording clerk was positioned in such a way to ensure proper audibility of the clerk and visibility of the examiner so that the examiner could see the codes being recorded in the form to avoid possible errors. Once the oral health assessment was complete, the participant was engaged in one-on-one session with the principal investigator for the personal interview to evaluate their habits.

h) Instruments and supplies:

Sufficient number of materials were carried which included:

- CPI probe
- Mouth mirrors
- Chip blower
- Korsolex Solution for cold Sterilization
- Gauze and cotton
- Tweezers
- Kidney trays
- Autoclave
- Cloth hand towels
- Torch
- Gloves and mouth masks
- WHO Oral Health proforma and questionnaire.

Statistical analysis

The data collected was entered in Microsoft Excel 2019 by the principal investigator. Statistical analysis was carried out using IBM-SPSS® Statistics Version 21 (USA). Kolmogorov–Smirnov test showed the data was skewed. The numbers, means, and standard deviations, were determined and given as graphs and tables for better interpretation.

Non parametric tests and the Chi-square test compared frequencies and Kruskal Wallis test was employed for comparing means among different categories. The $p \leq 0.05$ is considered significant.

Photographs illustrating the study progression and methodology

Photograph 1: Armamentarium used in the study

Photograph 2: Community Health worker filling the informed consent form

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

Photograph 4: Oral examination carried out at another site

RESULTS

Table 1 and **Figure 1** depict the demographic profile of the CHW. The study had female predominance (100%) with an average age of 40.12 ± 7.79. There were equal number (243) of ANM, AWW and ASHA. Majority of the Community Health Workers belong category of 30 – 40 years of age (39.2%) followed by 41 – 50 years (38.6%), > 50 years (12.2%) and the least number of participants was observed in < 30 years (10.0%).

Table 2 and **Figure 2** depicts mean DMFT score, DT, MT and FT scores among the various age group of the Community Health Workers. The highest score was observed in the age of >50 years (15.04 ± 1.78) and the least among < 30 years (8.70 ± 4.94) with highly notable difference (p = <0.001*). Taking DT component into consideration, no difference was seen among the age of the Community Health Workers. Age groupwise comparison of MT score showed significant difference (p<0.001*) with highest mean MT score in >50 years (6.63 ± 1.63) and minimum among <30 years (2.03 ± 1.72). The FT component also expressed statistical difference (p < 0.001*) among the various age with highest FT score among 30 – 40 years (0.49 ± 0.87) and lowest among < 30 years (0.14 ± 0.48).

Table 3 and **Figure 3** represents comparison of DMFT scores among the various types of CHW showing highest DMFT score as 10.86 ± 4.96 among ANM and the lowest DMFT score of 10.14 ± 4.53 among AWW. The highest DT score was seen among the ANM while the ASHA proclaimed the highest DT score of 7.67 ± 3.82 and FT score of 0.36 ± 0.74. The AWW claimed the lowest DT score (7.21 ± 4.02) and MT score (2.62 ± 2.21) while ANM claimed the lowest FT score (0.30 ± 0.67). But DMFT and all its components (DT, MT, FT scores) expressed similarity.

Table 4 and **Figure 4** represent caries prevalence distributed according to the age group and types of CHW and it can be observed that the overall prevalence of caries was found to be 86.1%. Age group wise distribution of caries prevalence showed highly statistical significance ($p<0.001$*) with the highest prevalence among > 50 years and the lowest among < 30 years. But the types of CHW showed similar caries prevalence with higher caries prevalence seen among the ASHA and least among the AWW.

Table 5 and **Figure 5** present the prevalence of Bleeding on Probing (BOP) among the CHW. In age groupwise comparison of BOP, difference was notable ($p<0.001$*) with the highest proportion of BOP seen in > 50 years (85.4%) and lowest among 30-40 years (56.6 %). When the type of Community Health Workers was taken, the proportion of BOP was almost the same in all the three group with no much difference ($p = 0.994$).

Table 6 and **Figure 6** demonstrate the distribution of Periodontal Pocket Depth (PPD) among the demographic groups of the Community Health Workers. It can be observed that the least proportion of PPD was observed in < 30 years age group (4.1%) and AWW group (17.7%) while the greatest portion of PPD seen among > 50 years (34.8%) and ASHA Workers (21.4%). A notable difference was seen during age group wise comparison of PPD while types of Community Health Workers ($p = 0.588$) showed similar trend.

Table 7 and **Figure 7** show comparison of Loss of Attachment (LOA) among various demographic groups of the Community Health Workers. When age group of the participants was considered, there was a notable difference ($p < 0.001$*) with highest proportion for LOA found among > 50 years (97.8%) and the least among < 30 years (15.1%). Considering the type of Community Health Workers, ANM had

the highest prevalence of LOA (56.4%) and AWW had the lowest (40.7%) with significant difference among the types of Community Health Workers (p = 0.002*).

Table 8 and **Figure 8** depicts demographic variations in partial denture of the CHW. Distribution according to age showed high differences (p < 0.001*) with > 50 years contributing highest proportion (15.7%) and < 30 years with no partial denture (0.0%). On the other hand, various types of CHW exhibited similar findings (p = 0.329) with ASHA Workers demonstrating the higher prevalence (6.2%) and the least among ANM (3.3%).

Table 9 and **Figure 9** presents the dental trauma among demographic groups of the CHW. Age group wise comparison of dental trauma showed notable difference (p = 0.046*) with the highest prevalence among the age of 30 – 40 years (4.9%) and the lowest among > 50 years. Among the various types of CHW, not much variations (p = 0.643) were observed it was comparatively lesser in ANM (2.1%) than AWW and ASHA which was 3.3%.

Table 10 and **Figure 10** represents the dental fluorosis prevalence among the various demographic groups of the CHW. Dental fluorosis was found in 12.3% of the population among which majority of them had mild dental fluorosis. Age wise comparison (p = 0.972) and different types of CHW (p = 0.155) were similar with higher percentage seen among < 30 years of age (13.7%) and AWW (15.2%) while the lowest proportion seen among in 40 - 50 years (11.7%) and ASHA (12.3%).

Table 11, Table 12 and **Figure 11** show the comparison of oral mucosal lesions and its location among the various demographic groups. The prevalence of leukoplakia, aphthous ulcer and abscess was found to be 0.5%, 1.1% and 2.5% respectively with notable differences (p <0.001*) between the various age of CHW

while it was similar between types of CHW ($p = 0.575$). When the location of the oral mucosal lesions was taken into consideration, 0.1%, 1.2%, 2.5%, 0.3% of the lesions were found in sulci, buccal mucosa, alveolar ridge/gingiva and vermillion border respectively. In location of lesions, notable age wise variation was seen ($p < 0.001$*) while types of CHW showed similar findings ($p = 0.792$).

Table 13, Table 14, Figure 12 and **Figure 13** depict the number of teeth with treatment needs among the various demographic groups of the CHW. The average number teeth requiring one surface filling, two or more surface filling, pulp therapy, extraction and prosthetic need were found to be maximum in the age groups of > 50 years (3.92 ± 3.68), < 30 years (3.29 ± 3.95), 30 – 40 years (2.07 ± 3.26), 30 – 40 years (0.70 ± 1.05) and > 50 years (4.75 ± 1.46) respectively. However, statistically significant difference was observed in one surface filling ($p < 0.001$*), pulpal therapy ($p = 0.009$*), extraction ($p = 0.026$*) and prosthetic needs ($p < 0.001$*) while two or more surface filling showed similar patterns ($p = 0.084$). Considering the various types of CHW, not much difference was observed in terms of one surface filling ($p = 0.574$), two or more surface filling ($p = 0.803$), Pulp therapy ($p = 0.241$) and extraction ($p = 0.250$) unlike prosthetic needs ($p = 0.002$*).

Table 15, Table 16 and **Figure 14** show comparison of oral hygiene habits among the various demographic groups of the CHW. It can be observed that 52.7% of the CHW clean their teeth once a day while 47.3% of the participants clean twice or more times a day. Majority of the Community Health Workers use toothbrush (95.5%) and toothpaste (95.5%) to clean their teeth while 4.5% of the participants use charcoal or chewstick. 32.0 % of the participants used fluoridated toothpaste while 32.1% did not use and 35.9% were not aware about fluoridated tooth paste. Considering the last dental visit, 14.4% never received dental care, 31% visited

dentist within a year while 54.5% of the participants had their last dental visit more than a year before. All these oral hygiene exhibited no notable variation among the various age group and type of Community Health Workers except for usage of fluoride group which notable difference ($p = 0.007$*) between the various age group of the Community Health Workers.

Table 17, Table 18 and **Figure 15** represent the frequency of tobacco chewing habit among the Community Health Workers. Majority of the participants (77.5%) never used tobacco while 9.2% of the participants seldom had tobacco. Among the participants with the habit of chewing tobacco, 7.5%, 4.1% and 1.6% had consumed tobacco several times a month, once a week and several times a week respectively. None of the participants consumed tobacco every day. Age group wise comparison of tobacco chewing showed highly statistically significance difference ($p < 0.001$*) however not much variation was observed between the various types of Community Health Workers ($p = 0.324$).

Table 19 represents frequency of sugar intake among the CHW. Frequency of consumption of sugary food reported notable difference ($p < 0.001$*) in consumption of different sugary food items with notable difference was seen in the consumption of tea ($p = 0.527$) and coffee with sugar ($p = 0.236$). 18.9% and 15.8 % of the participants consumed tea and coffee with sugar several times a day respectively.

Table 20 depicts the association of tobacco chewing habit with DMFT, PPD, LOA and prevalence of oral mucosal lesions by spearman correlation. It can be observed that tobacco chewing has positive correlation with DMFT (rho = 0.410, $p < 0.001$*), PPD (rho = 0.234, $p < 0.001$*), LOA (rho = 0.401, $p < 0.001$*) and the prevalence of oral mucosal lesions (rho = 0.366, $p < 0.001$*) with highly significant statistical difference.

Table 21 represents the association of oral hygiene habits score with caries experience and periodontal status of the Community Health Workers. The oral hygiene score was derived by adding of scores given for each question for each participant. Better scores were given for good oral hygiene habits thereby greater score indicates better oral hygiene habits of the Community Health Workers. It can be observed that Oral hygiene habit score was negatively correlated with DMFT (rho = -0.019), PPD (rho = -0.093) and LOA (rho = - 0.056) indicating participants with higher scores had less caries experience, less periodontal pocket and gingival recession. Although, the correlation of oral hygiene habit score with DMFT and LOA was statistically not significant, it was found to be significant with PPD (p = 0.012*).

Table 1: Demographic details of the Community Health Workers

Demographic details		Types of Community Health Workers					
		ANM (n=243)		AWW (n=243)		ASHA (n=243)	
		n	**(%)**	**n**	**(%)**	**n**	**(%)**
Age group	< 30 years	24	(9.9%)	26	(10.7%)	23	(9.5%)
	30-40 years	90	(37.0%)	98	(40.3%)	98	(40.3%)
	41-50 years	92	(37.9%)	97	(39.9%)	92	(37.9%)
	>50 years	37	(15.2%)	22	(9.1%)	30	(12.3%)
Gender	Male	0	(0.0%)	0	(0.0%)	0	(0.0%)
	Female	243	(100.0%)	243	(100.0%)	243	(100.0%)

ANM- Auxiliary Nurse Midwives; AWW-Anganwadi workers; ASHA- Accredited Social Health Activist; All values are expressed as frequency and percentage (in parentheses).

Table 2: Comparison of DMFT scores among various age group of the Community Health Workers

Scores	Age groups	n	Mean ± SD	H-value	*p*- value
DT	< 30 years	73	6.53 ± 4.73	2.53	0.469
	30-40 years	286	7.30 ± 4.46		
	41-50 years	281	7.61 ± 3.67		
	>50 years	89	8.24 ± 2.20		
MT	< 30 years	73	2.03 ± 1.72	198.79	<0.001*
	30-40 years	286	2.11 ± 1.52		
	41-50 years	281	2.48 ± 2.25		
	>50 years	89	6.63 ± 1.63		
FT	< 30 years	73	0.14 ± 0.48	20.38	<0.001*
	30-40 years	286	0.49 ± 0.87		
	41-50 years	281	0.25 ± 0.55		
	>50 years	89	0.18 ± 0.51		
DMFT	< 30 years	73	8.70 ± 4.94	120.01	<0.001*
	30-40 years	286	9.90 ± 4.46		
	41-50 years	281	10.35 ± 4.65		
	>50 years	89	15.04 ± 1.78		

DMFT- Decayed, Missing and Filled teeth; DT- Decayed Teeth; MT- Missing Teeth; FT- Filled teeth; SD- Standard deviation; All values are expressed as mean ± SD; Statistical test applied: Kruskal-Wallis test; Level of significance: p-value ≤ 0.05 is considered statistically significant.*

Table 3: Comparison of DMFT scores among various types of the Community Health Workers

Scores	Types	n	Mean ± SD	H-value	*p*- value
DT	ANM	243	7.48 ± 4.13	1.39	0.499
	AWW	243	7.21 ± 4.02		
	ASHA	243	7.67 ± 3.82		
MT	ANM	243	3.07 ± 2.41	5.10	0.078
	AWW	243	2.62 ± 2.21		
	ASHA	243	2.70 ± 2.42		
FT	ANM	243	0.30 ± 0.67	0.63	0.731
	AWW	243	0.31 ± 0.67		
	ASHA	243	0.36 ± 0.74		
DMFT	ANM	243	10.86 ± 4.96	4.92	0.086
	AWW	243	10.14 ± 4.53		
	ASHA	243	10.74 ± 4.52		

ANM- Auxiliary Nurse Midwives; AWW-Anganwadi workers; ASHA- Accredited Social Health Activist; DMFT- Decayed, Missing and Filled teeth; DT- Decayed Teeth; MT- Missing Teeth; FT- Filled teeth; SD- Standard deviation; All values are expressed as mean ± SD; Statistical test applied: Kruskal- Wallis test; Level of significance: p-value ≤ 0.05 is considered statistically significant.*

Table 4: Comparison of prevalence of caries among various demographic groups of the Community Health Workers

Caries prevalence		**Present**		**Absent**		X^2	***p*- value**
		n	**(%)**	**n**	**(%)**		
Age group	< 30 years	55	(75.3%)	18	(24.7%)	39.10	<0.001*
	30-40 years	227	(79.4%)	59	(20.6%)		
	41-50 years	257	(91.5%)	24	(8.5%)		
	>50 years	89	(100.0%)	0	(0.0%)		
Types	ANM	208	(85.6%)	35	(14.4%)	1.82	0.403
	AWW	205	(84.4%)	38	(15.6%)		
	ASHA	215	(88.5%)	28	(11.5%)		

ANM- Auxiliary Nurse Midwives; AWW-Anganwadi workers; ASHA- Accredited Social Health Activist; All values are expressed as frequency and percentage (in parentheses). Statistical tests applied: Chi-square test; Level of significance: p-value ≤ 0.05 is considered significant.*

Table 5: Comparison of Bleeding on Probing among various demographic groups of the Community Health Workers

BOP		**Present**		**Absent**		X^2	***p*- value**
		n	**(%)**	**n**	**(%)**		
Age group	< 30 years	44	(60.3%)	29	(39.7%)	30.54	<0.001*
	30-40 years	162	(56.6%)	124	(43.4%)		
	41-50 years	200	(71.2%)	81	(28.8%)		
	>50 years	76	(85.4%)	13	(14.6%)		
Types	ANM	161	(66.3%)	82	(33.7%)	0.01	0.994
	AWW	161	(66.3%)	82	(33.7%)		
	ASHA	160	(65.8%)	83	(34.2%)		

BOP-Bleeding on Probing; ANM- Auxiliary Nurse Midwives; AWW-Anganwadi workers; ASHA- Accredited Social Health Activist; All values are expressed as frequency and percentage (in parentheses). Statistical tests applied: Chi-square test; Level of significance: p-value ≤ 0.05 is considered significant.*

Table 6: Comparison of Periodontal Pocket Depth among various demographic groups of the Community Health Workers

PPD		Present		Absent		X^2	*p*- value
		n	**(%)**	**n**	**(%)**		
Age group	< 30 years	3	(4.1%)	70	(95.9%)	67.20	<0.001*
	30-40 years	24	(8.4%)	262	(91.6%)		
	41-50 years	85	(30.2%)	196	(69.8%)		
	>50 years	31	(34.8%)	58	(65.2%)		
Types	ANM	48	(19.8%)	195	(80.2%)	1.06	0.588
	AWW	43	(17.7%)	200	(82.3%)		
	ASHA	52	(21.4%)	191	(78.6%)		

PPD- Periodontal Pocket Depth; ANM- Auxiliary Nurse Midwives; AWW-Anganwadi workers; ASHA- Accredited Social Health Activist; All values are expressed as frequency and percentage (in parentheses). Statistical tests applied: Chi-square test; Level of significance: p-value ≤ 0.05 is considered significant.*

Table 7: Comparison of Loss of Attachment among various demographic groups of the Community Health Workers

LOA		**Present**		**Absent**		X^2	***p*- value**
		n	**(%)**	**n**	**(%)**		
Age group	< 30 years	11	(15.1%)	62	(84.9%)	125.77	<0.001*
	30-40 years	117	(40.9%)	169	(59.1%)		
	41-50 years	134	(47.7%)	147	(52.3%)		
	>50 years	87	(97.8%)	2	(2.2%)		
Types	ANM	137	(56.4%)	106	(43.6%)	12.18	0.002*
	AWW	99	(40.7%)	144	(59.3%)		
	ASHA	113	(46.5%)	130	(53.5%)		

LOA- Loss of Attachment; ANM- Auxiliary Nurse Midwives; AWW-Anganwadi workers; ASHA- Accredited Social Health Activist; All values are expressed as frequency and percentage (in parentheses). Statistical tests applied: Chi-square test; Level of significance: p-value ≤ 0.05 is considered significant.*

Table 8: Comparison of partial denture among various demographic groups of the Community Health Workers

Partial denture		**Present**		**Absent**		X^2	***p*- value**
		n	**(%)**	**n**	**(%)**		
Age group	< 30 years	0	(0.0%)	73	(100.0%)	28.74	<0.001*
	30-40 years	12	(4.2%)	274	(95.8%)		
	41-50 years	9	(3.2%)	272	(96.8%)		
	>50 years	14	(15.7%)	75	(84.3%)		
Types	ANM	8	(3.3%)	235	(96.7%)	2.22	0.329
	AWW	12	(4.9%)	231	(95.1%)		
	ASHA	15	(6.2%)	228	(93.8%)		

ANM- Auxiliary Nurse Midwives; AWW-Anganwadi workers; ASHA- Accredited Social Health Activist; All values are expressed as frequency and percentage (in parentheses). Statistical tests applied: Chi-square test; Level of significance: p-value ≤ 0.05 is considered significant.*

Table 9: Comparison of dental trauma among various demographic groups of the Community Health Workers

Dental trauma		Present		Absent		X^2	*p* - value
		n	**(%)**	**n**	**(%)**		
Age group	< 30 years	2	(2.7%)	71	(97.3%)	8.01	0.046*
	30-40 years	14	(4.9%)	272	(95.1%)		
	41-50 years	5	(1.8%)	276	(98.2%)		
	>50 years	0	(0.0%)	89	(100.0%)		
Types	ANM	5	(2.1%)	238	(97.9%)	0.88	0.643
	AWW	8	(3.3%)	235	(96.7%)		
	ASHA	8	(3.3%)	235	(96.7%)		

ANM- Auxiliary Nurse Midwives; AWW-Anganwadi workers; ASHA- Accredited Soc Health Activist; All values are expressed as frequency and percentage (in parenthese Statistical tests applied: Chi-square test; Level of significance: p-value ≤ 0.05 is consider significant.*

Table 10: Comparison of dental fluorosis among various demographic groups of t Community Health Workers

Dental fluorosis		**Present**		**Absent**		X^2	***p*- value**
		n	**(%)**	**n**	**(%)**		
Age group	< 30 years	10	(13.7%)	63	(86.3%)	0.23	0.972
	30-40 years	36	(12.6%)	250	(87.4%)		
	41-50 years	33	(11.7%)	248	(88.3%)		
	>50 years	11	(12.4%)	78	(87.6%)		
Types	ANM	23	(9.5%)	220	(90.5%)	3.28	0.155
	AWW	37	(15.2%)	206	(84.8%)		
	ASHA	30	(12.3%)	213	(87.7%)		

ANM- Auxiliary Nurse Midwives; AWW-Anganwadi workers; ASHA- Accredited Social Health Activist; All values are expressed as frequency and percentage (in parentheses). Statistical tests applied: Chi-square test; Level of significance: p-value ≤ 0.05 is considered significant.*

Table 11: Comparison of oral mucosal lesions among various demographic groups of the Community Health Workers

Oral mucosal lesions		**No lesion**		**Leukoplakia**		**Aphthous ulcer**		**Abscess**		X^2	***p*- value**
		n	**(%)**	**n**	**(%)**	**n**	**(%)**	**n**	**(%)**		
Age group	< 30 years	73	(100.0%)	0	(0.0%)	0	(0.0%)	0	(0.0%)	175.58	<0.001*
	30-40 years	286	(100.0%)	0	(0.0%)	0	(0.0%)	0	(0.0%)		
	41-50 years	273	(97.2%)	0	(0.0%)	8	(2.8%)	0	(0.0%)		
	>50 years	67	(75.3%)	4	(4.5%)	0	(0.0%)	18	(20.2%)		
Types	ANM	232	(95.5%)	2	(0.8%)	1	(0.4%)	8	(3.3%)	4.76	0.575
	AWW	234	(96.3%)	0	(0.0%)	4	(1.6%)	5	(2.1%)		
	ASHA	233	(95.9%)	2	(0.8%)	3	(1.2%)	5	(2.1%)		

ANM- Auxiliary Nurse Midwives; AWW-Anganwadi workers; ASHA- Accredited Social Health Activist; All values are expressed as frequency and percentage (in parentheses). Statistical tests applied: Chi-square test; Level of significance: p-value ≤ 0.05 is considered significant.*

Table 12: Comparison of location of oral mucosal lesions among various demographic groups of the Community Health Workers

Location of oral mucosal lesions		**Sulci**		**Buccal mucosa**		**Alveolar ridge/ gingiva**		**Vermilion border**		X^2	***p*- value**
		n	**(%)**	**n**	**(%)**	**n**	**(%)**	**n**	**(%)**		
Age group	< 30 years	0	(0.0%)	0	(0.0%)	0	(0.0%)	0	(0.0%)	151.61	<0.001*
	30-40 years	0	(0.0%)	0	(0.0%)	0	(0.0%)	0	(0.0%)		
	41-50 years	1	(0.4%)	5	(1.8%)	0	(0.0%)	2	(0.7%)		
	>50 years	0	(0.0%)	4	(4.5%)	18	(20.2%)	0	(0.0%)		
Types	ANM	0	(0.0%)	3	(1.2%)	8	(3.3%)	0	(0.0%)	4.67	0.792
	AWW	1	(0.4%)	2	(0.8%)	5	(2.1%)	1	(0.4%)		
	ASHA	0	(0.0%)	4	(1.6%)	5	(2.1%)	1	(0.4%		

ANM- Auxiliary Nurse Midwives; AWW-Anganwadi workers; ASHA- Accredited Social Health Activist; All values are expressed as frequency and percentage (in parentheses). Statistical tests applied: Chi-square test; Level of significance: p-value ≤ 0.05 is considered significant.*

Table 13: Comparison of number of teeth with treatment needs among various age groups of the Community Health Workers

Number of teeth with treatment needs	Age group	n	Mean ± SD	H-value	*p*- value
One surface filling	< 30 years	73	1.18 ± 1.47	44.28	<0.001*
	30-40 years	286	2.14 ± 3.37		
	41-50 years	281	2.70 ± 3.22		
	>50 years	89	3.92 ± 3.68		
Two or more surface filling	< 30 years	73	3.29 ± 3.95	6.65	0.084
	30-40 years	286	2.46 ± 3.87		
	41-50 years	281	2.35 ± 2.97		
	>50 years	89	2.87 ± 3.51		
Pulp care and restoration	< 30 years	73	1.74 ± 3.32	11.68	0.009*
	30-40 years	286	2.07 ± 3.26		
	41-50 years	281	1.98 ± 3.63		
	>50 years	89	0.87 ± 1.98		
Extraction	< 30 years	73	0.44 ± 0.73	9.24	0.026*
	30-40 years	286	0.70 ± 1.05		
	41-50 years	281	0.62 ± 1.23		
	>50 years	89	0.60 ± 0.81		
Prosthetic need	< 30 years	73	0.63 ± 1.14	305.67	<0.001*
	30-40 years	286	0.30 ± 0.86		
	41-50 years	281	1.34 ± 1.86		
	>50 years	89	4.75 ± 1.46		

SD- Standard deviation; All values are expressed as mean ± SD; Statistical test applied: Kruskal-Wallis test; Level of significance: p value ≤ 0.05 is considered statistically significant.*

Table 14: Comparison of treatment needs among various types of the Community Hea Workers

Treatment needs	Types	n	Mean ± SD	H-value	*p*- value
One surface filling	ANM	243	2.55 ± 3.22	1.11	0.574
	AWW	243	2.43 ± 3.38		
	ASHA	243	2.46 ± 3.27		
Two or more surface filling	ANM	243	2.71 ± 3.68	0.44	0.803
	AWW	243	2.42 ± 3.31		
	ASHA	243	2.51 ± 3.56		
Pulp care and restoration	ANM	243	1.68 ± 3.18	2.84	0.241
	AWW	243	1.85 ± 3.27		
	ASHA	243	2.05 ± 3.47		
Extraction	ANM	243	0.58 ± 0.99	2.77	0.250
	AWW	243	0.59 ± 1.06		
	ASHA	243	0.71 ± 1.16		
Prosthetic need	ANM	243	1.61 ± 2.09	12.03	0.002*
	AWW	243	1.01 ± 1.79		
	ASHA	243	1.21 ± 1.99		

ANM- Auxiliary Nurse Midwives; AWW-Anganwadi workers; ASHA- Accredited Social Health Activist; SD- Standard deviation; All values are expressed as mean ± SD; Statistical test applied: Kruskal- Wallis test; Level of significance: p value ≤ 0.05 is considered statistically significant.*

Table 15: Comparison of oral hygiene practices among various age group of the Community Health Workers

Oral hygiene practices	**Age group**								X^2	***p*-value**
	< 30 years		**30 – 40 years**		**41-50 years**		**> 50 years**			
	n	**(%)**	**n**	**(%)**	**n**	**(%)**	**n**	**(%)**		
Frequency of cleaning teeth										
Once a day	35	(47.9%)	158	(55.2%)	148	(52.7%)	43	(48.3%)	2.09	0.554
Twice or more a day	38	(52.1%)	128	(44.8%)	133	(47.3%)	46	(51.7%)		
Aid used to clean teeth										
Toothbrush	71	(97.3%)	274	(95.8%)	264	(94.0%)	87	(97.8%)	3.19	0.363
Chewstick/Charcoal	2	(2.7%)	12	(4.2%)	17	(6.0%)	2	(2.2%)		
Use of toothpaste										
Yes	69	(94.5%)	273	(95.5%)	269	(95.7%)	85	(95.5%)	0.20	0.978
No	4	(5.5%)	13	(4.5%)	12	(4.3%)	4	(4.5%)		
Use of toothpaste that contains fluoride										
Yes	32	(43.8%)	104	(36.4%)	74	(26.3%)	23	(25.8%)	17.85	0.007*
No	24	(32.9%)	92	(32.2%)	92	(32.7%)	26	(29.2%)		
Don’t know	17	(23.3%)	90	(31.5%)	115	(40.9%)	40	(44.9%)		
Last dental visit										
< 6 months	14	(19.2%)	41	(14.3%)	38	(13.5%)	9	(10.1%)	14.81	0.465
6-12 months	15	(20.5%)	52	(18.2%)	47	(16.7%)	10	(11.2%)		
More than 1 year but less than 2 years	13	(17.8%)	41	(14.3%)	43	(15.3%)	9	(10.1%)		
2 years or more but less than 5 years	12	(16.4%)	49	(17.1%)	47	(16.7%)	22	(24.7%)		
5 years or more	10	(13.7%)	64	(22.4%)	67	(23.8%)	21	(23.6%)		
Never received dental care	9	(12.3%)	39	(13.6%)	39	(13.9%)	18	(20.2%)		

All values are expressed as frequency and percentage (in parentheses). Statistical tests applied: Chi-square test; Level of significance: p-value ≤ 0.05 is considered significant.*

Table 16: Comparison of oral hygiene practices among various types of the Community Health Workers

Oral hygiene practices	CHW						X^2	*p*- value
	ANM		AWW		ASHA			
	n	(%)	n	(%)	n	(%)		
				Frequency of cleaning teeth				
Once a day	130	(53.5%)	121	(49.8%)	133	(54.7%)	1.29	0.525
Twice or more a day	113	(46.5%	122	(50.2%)	110	(45.3%)		
				Aid used to clean teeth				
Toothbrush	234	(96.3%)	235	(96.7%)	227	(93.4%)	3.62	0.164
Chewstick/Charcoal	9	(3.7%)	8	(3.3%)	16	(6.6%)		
				Use of toothpaste				
Yes	233	(95.9%)	230	(94.7%)	233	(95.9%)	0.57	0.752
No	10	(4.1%)	13	(5.3%)	10	(4.1%)		
				Use of toothpaste that contains fluoride				
Yes	78	(32.1%)	80	(32.9%)	75	(30.9%)		
No	77	(31.7%)	74	(30.5%)	83	(34.2%)	0.80	0.938
Don't know	88	(36.2%)	89	(36.6%)	85	(35.0%)		
				Last dental visit				
< 6 months	34	(14.0%)	34	(14.0%)	34	(14.0%)		
6-12 months	36	(14.8%)	45	(18.5%)	43	(17.7%)		
More than 1 year but less than 2 years	35	(14.4%)	32	(13.2%)	39	(16.0%)		
2 years or more but less than 5 years	42	(17.3%)	43	(17.7%)	45	(18.5%)	3.11	0.979
5 years or more	58	(23.9%)	53	(21.8%)	51	(21.0%)		
Never received dental care	38	(15.6%)	36	(14.8%)	31	(12.8%)		

ANM- Auxiliary Nurse Midwives; AWW-Anganwadi workers; ASHA- Accredited Social Health Activist; All values are expressed as frequency and percentage (in parentheses). Statistical tests applied: Chi-square test; Level of significance: p-value ≤ 0.05 is considered significant.*

Table 17: Comparison of tobacco chewing among various age group of the Community Health Workers

Tobacco chewing	Age group								X^2	*p*- value
	< 30 years		30-40 years		41-50 years		> 50 years			
	n	(%)	n	(%)	n	(%)	n	(%)		
Never	71	(97.3%)	276	(96.5%)	200	(71.2%)	18	20.2%		
Seldom	2	(2.7%)	4	(1.4%)	50	(17.8%)	11	12.4%		
Several times a month	0	(0.0%)	6	(2.1%)	31	(11.0%)	18	20.2%		
Once a week	0	(0.0%)	0	(0.0%)	0	(0.0%)	30	33.7%	444.20	<0.001*
Several times a week	0	(0.0%)	0	(0.0%)	0	(0.0%)	12	13.5%		
Everyday	0	(0.0%)	0	(0.0%)	0	(0.0%)	0	0.0%		

All values are expressed as frequency and percentage (in parentheses). Statistical tests applied: Chi-square test; Level of significance: p-value ≤ 0.05 is considered significant.*

Table 18: Comparison of tobacco chewing habit among various types of the Community Health Workers

Tobacco chewing habit	Types						X^2	*p*- value
	ANM		AWW		ASHA			
	n	(%)	n	(%)	n	(%)		
Never	175	(72.0%)	199	(81.9%)	191	(78.6%)		
Seldom	30	(12.3%)	19	(7.8%)	18	(7.4%)		
Several times a month	21	(8.6%)	14	(5.8%)	20	(8.2%)		
Once a week	12	(4.9%)	9	(3.7%)	9	(3.7%)	9.22	0.324
Several times a week	5	(2.1%)	2	(0.8%)	5	(2.1%)		
Everyday	0	(0.0%)	0	(0.0%)	0	(0.0%)		

ANM- Auxiliary Nurse Midwives; AWW-Anganwadi workers; ASHA- Accredited Social Health Activist; All values are expressed as frequency and percentage (in parentheses). Statistical tests applied: Chi-square test; Level of significance: p-value ≤ 0.05 is considered significant.*

Table 19: Frequency distribution of sugar intake among the Community Health Workers

Food containing sugar	Seldom/ never	Several times a month	Once a week	Several times a week	Every day	Several times a day	*p*-value
Fresh fruit	126 (17.3%)	122 (16.7%)	132 (18.1%)	233 (32.0%)	116 (15.9%)	0 (0.0%)	<0.001 *
Biscuits, cakes, cream cakes	143 (19.6%)	120 (16.5%)	233 (32.0%)	229 (31.4%)	4 (0.5%)	0 (0.0%)	<0.001 *
Sweet pies, buns	130 (17.8%)	251 (34.4%)	219 (30.0%)	129 (17.7%)	0 (0.0%)	0 (0.0%)	<0.001 *
Jam or honey	121 (16.6%)	244 (33.5%)	185 (25.4%)	179 (24.6%)	0 (0.0%)	0 (0.0%)	<0.001 *
Chewing gum containing sugar	373 (51.2%)	337 (46.2%)	17 (2.3%)	2 (0.3%)	0 (0.0%)	0 (0.0%)	<0.001 *
Sweets/candy	162 (22.2%)	169 (23.2%)	182 (25.0%)	208 (28.5%)	8 (1.1%)	0 (0.0%)	<0.001 *
Lemonade, Coca Cola or other soft drinks	113 (15.5%)	119 (16.3%)	117 (16.0%)	373 (51.2%)	7 (1.0%)	0 (0.0%)	<0.001 *
Tea with sugar	128(17.6 %)	111 (15.2%)	119 (16.3%)	120 (16.5%)	113 (15.5%)	138 (18.9%)	0.527
Coffee with sugar	140 (19.2%)	125 (17.1%)	102 (14.0%)	128 (17.6%)	119 (16.3%)	115 (15.8%)	0.236

All values are expressed as frequency and percentage (in parentheses). Statistical tests applied: Chi-square test; Level of significance: p-value ≤ 0.05 is considered significant.*

Table 20: Correlation of tobacco chewing with caries experience, periodontal status and oral mucosal lesions of the Community Health Workers

Variables	Spearman correlation coefficient	Tobacco chewing habit
DMFT	rho	0.410
	p-value	<0.001*
PPD	rho	0.234
	p-value	<0.001*
LOA	rho	0.401
	p-value	<0.001*
Oral mucosal lesions	rho	0.366
	p-value	<0.001*

DMFT- Decayed Missing Filled teeth; PPD- Periodontal pocket depth; LOA- Loss of Attachment; Statistical test applied: Spearman correlation coefficient; p-value ≤ 0.05 is considered statistically significant.*

Table 21: Correlation of oral hygiene habits with caries experience and periodontal status of the Community Health Workers

Variables	Spearman correlation coefficient	Oral hygiene habits
DMFT	rho	-0.019
	p-value	0.616
PPD	rho	-0.093
	p-value	0.012*
LOA	rho	-0.056
	p-value	0.129

DMFT- Decayed Missing Filled teeth; PPD- Periodontal Pocket Depth; LOA- Loss of Attachment; Statistical test applied: Spearman correlation coefficient; p-value ≤ 0.05 is considered statistically significant.*

Figure 1: Distribution of the Community Health Workers based on various age groups

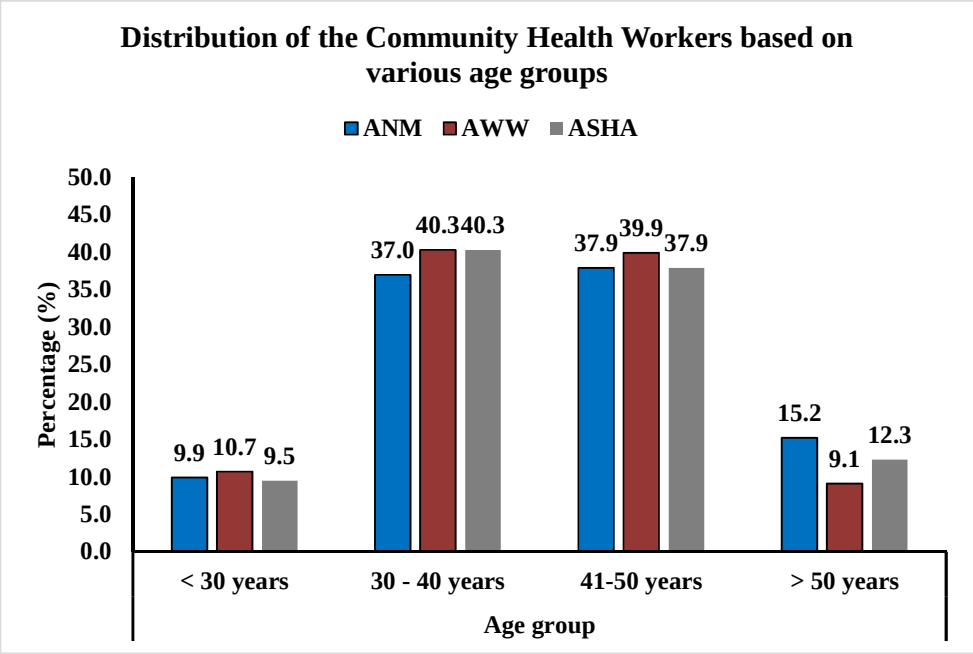


Figure 2: Comparison of DMFT scores among various age group of the Community Health Workers

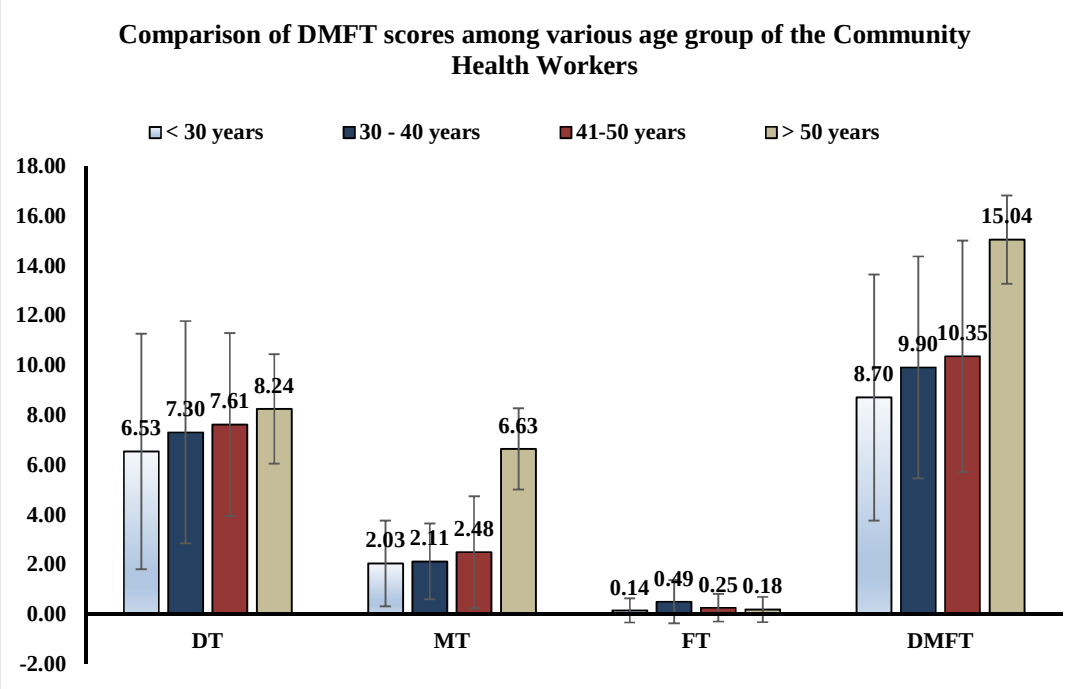


Figure 3: Comparison of DMFT scores among various types of Community Health Workers

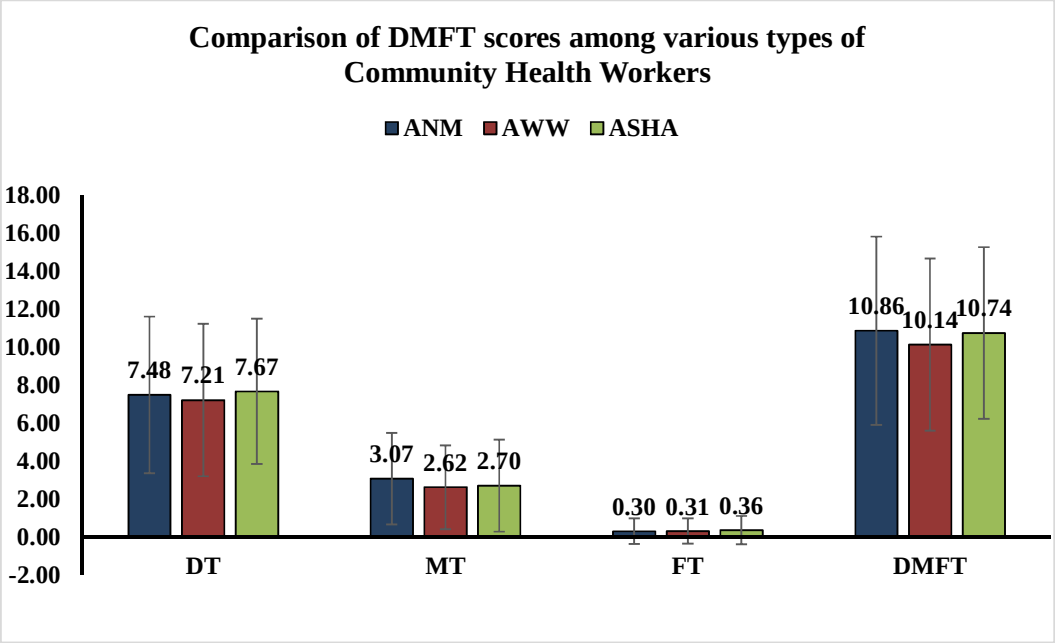


Figure 4: Comparison of caries prevalence among various demographic groups of the Community Health Workers

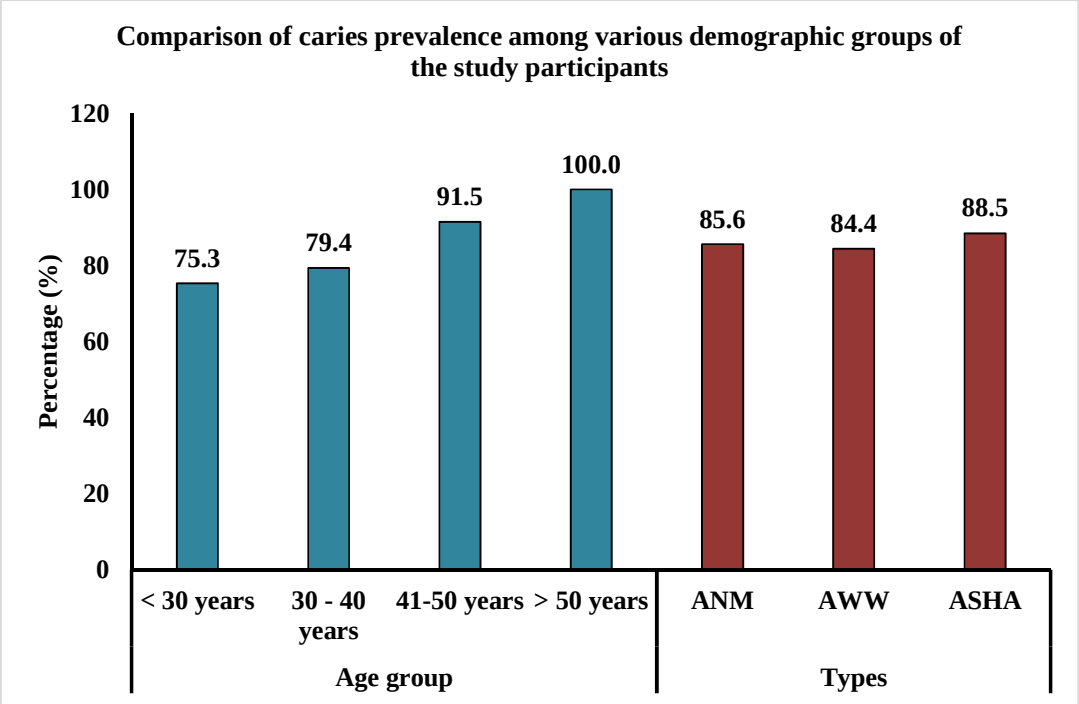


Figure 5: Comparison of Bleeding on Probing among various demographic groups of the Community Health Workers

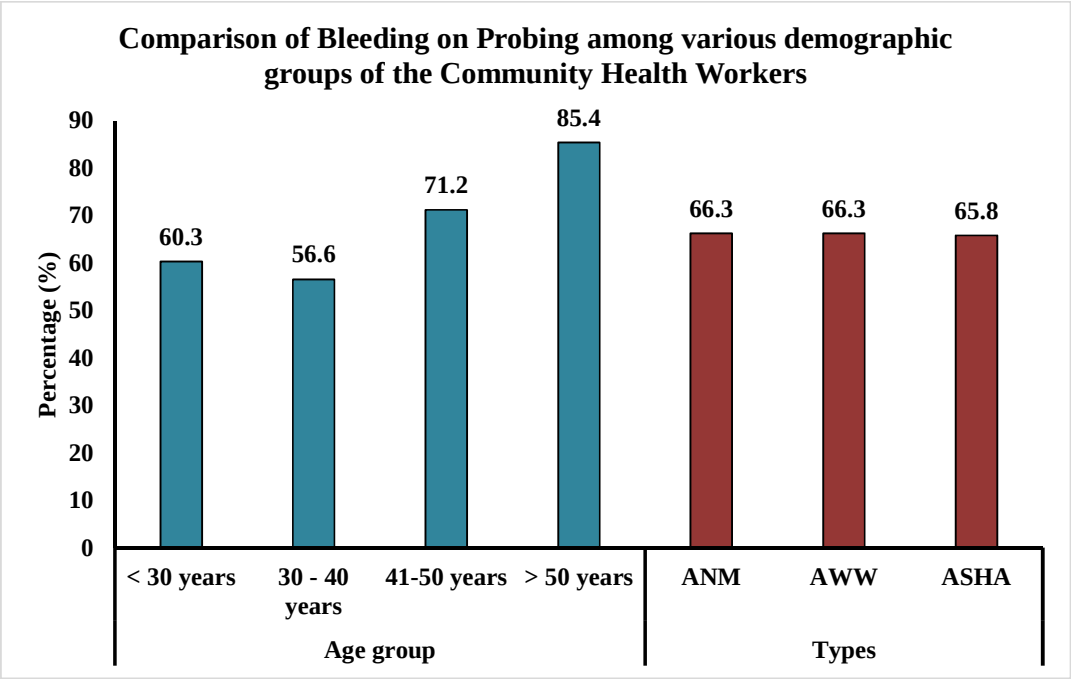


Figure 6: Comparison of Periodontal Pocket Depth among various demographic groups of the Community Health Workers

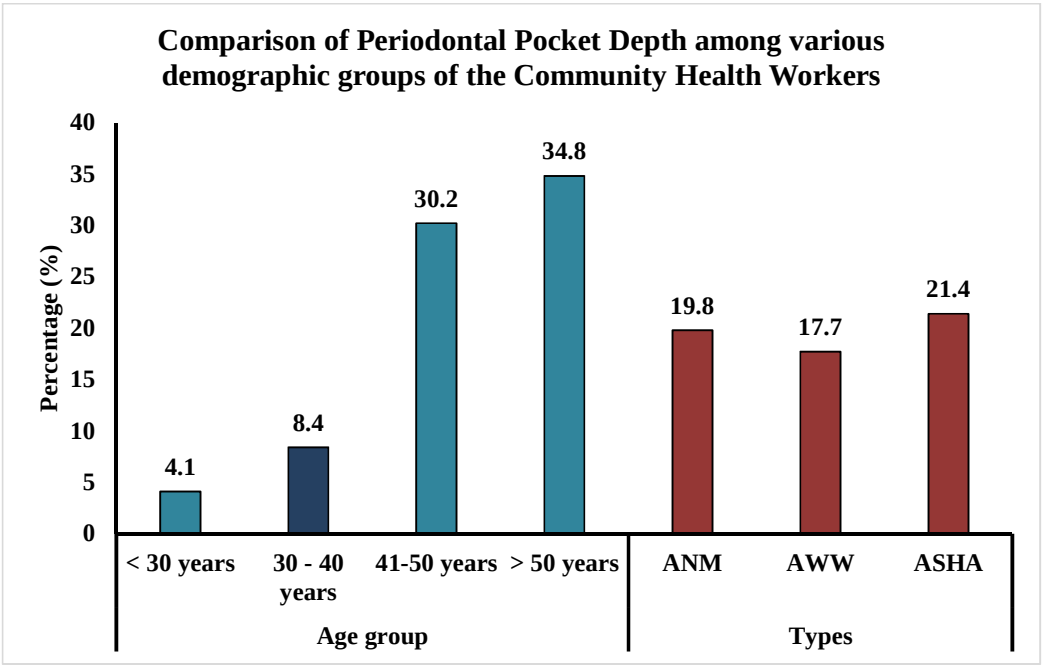


Figure 7: Comparison of Loss of Attachment among various demographic groups of the Community Health Workers

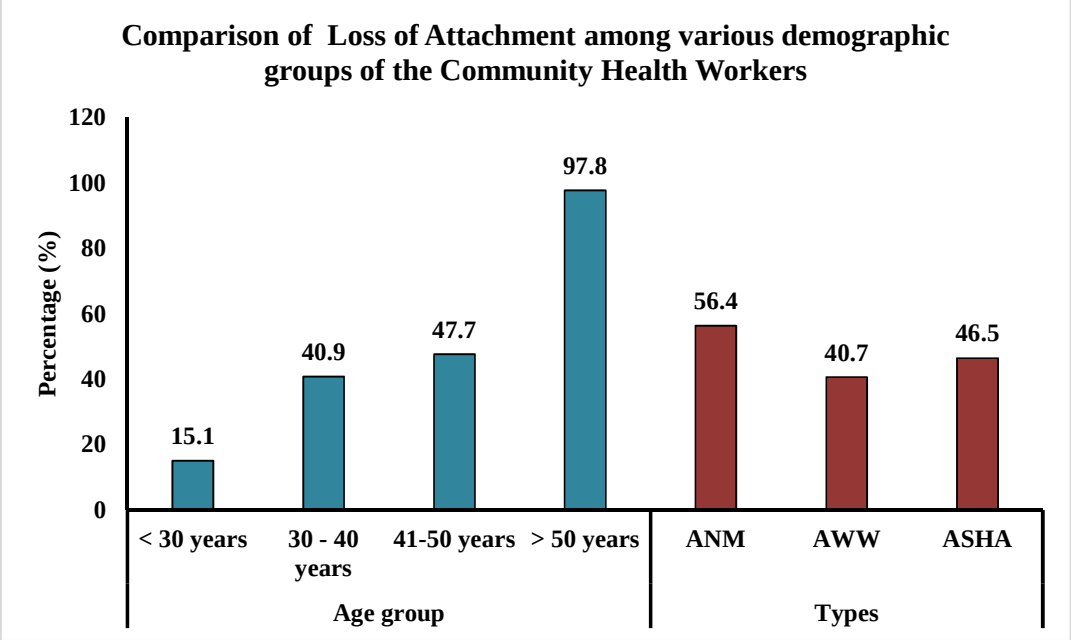


Figure 8: Comparison of partial denture among various demographic groups of the Community Health Workers

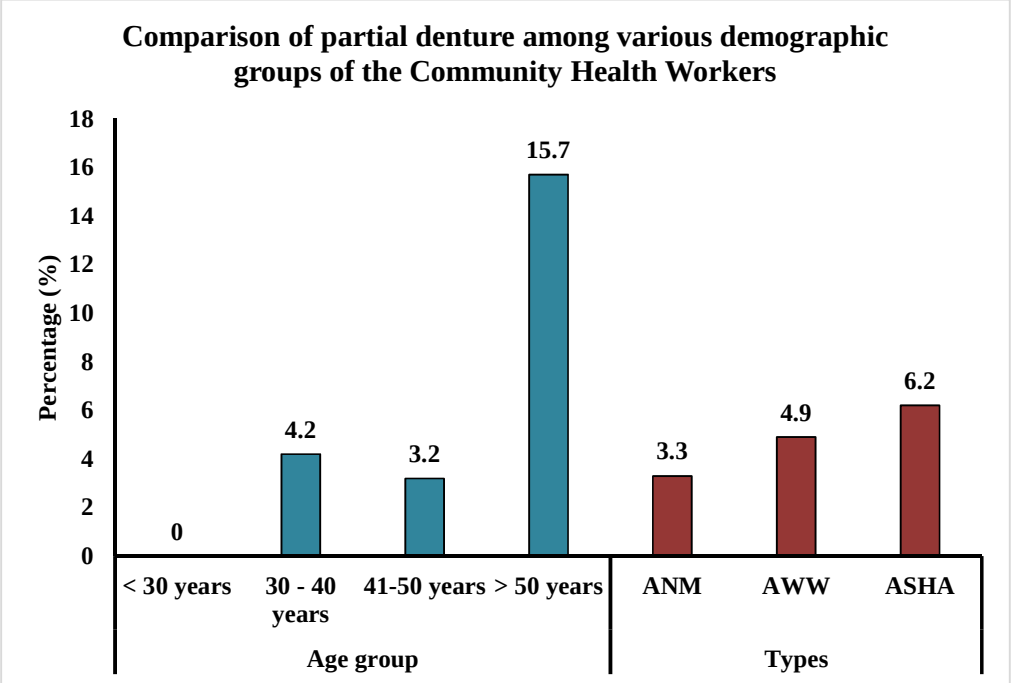


Figure 9: Comparison of dental trauma among various demographic groups of the Community Health Workers

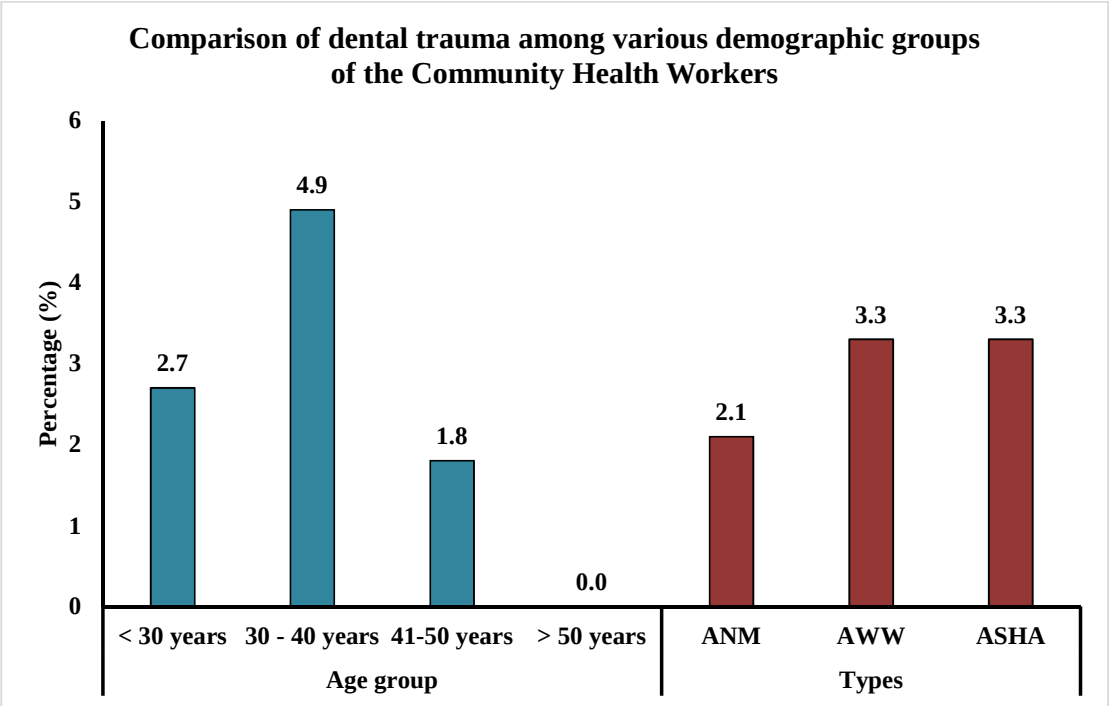


Figure 10: Comparison of dental fluorosis among various demographic groups of the Community Health Workers

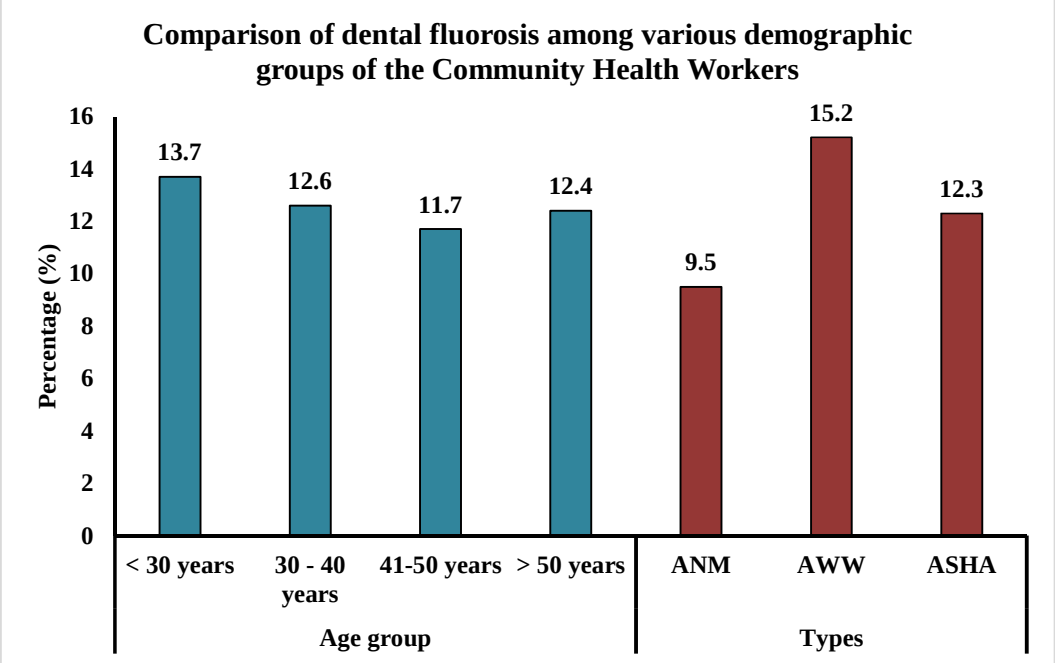


Figure 11: Prevalence of oral mucosal lesions and its location among the Community Health Workers

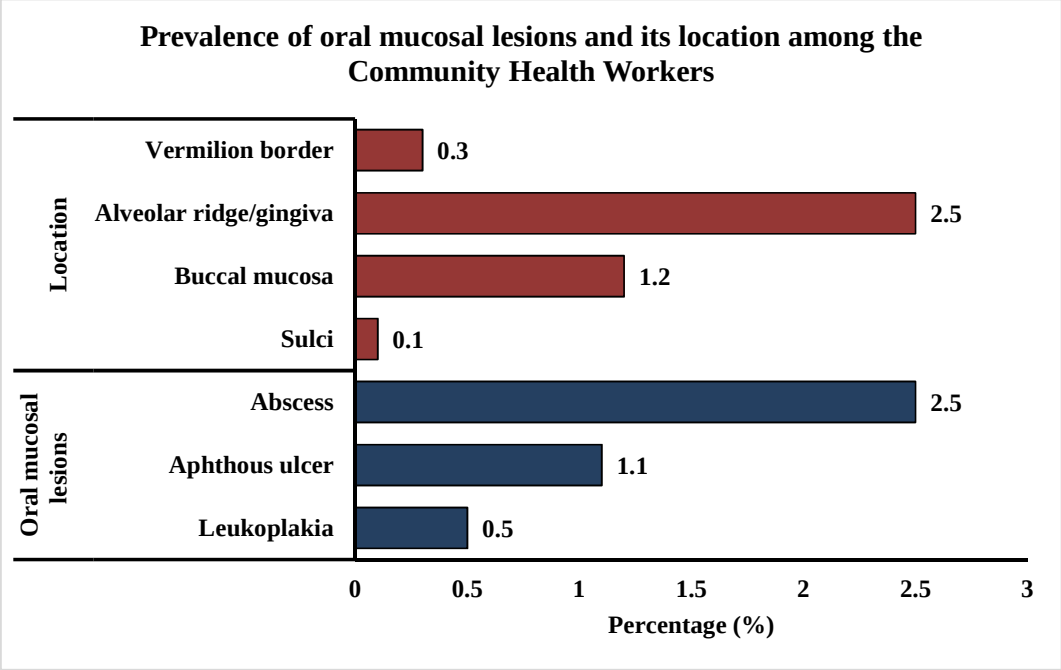


Figure 12: Comparison of number of teeth with treatment needs among various age group of the Community Health Workers

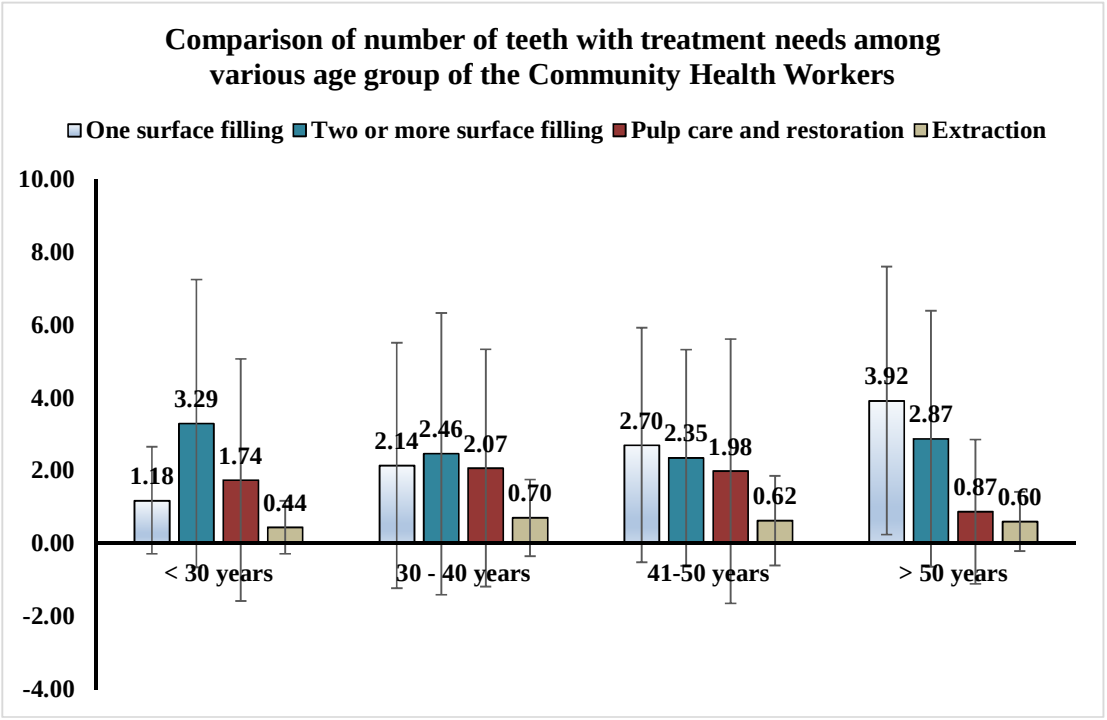


Figure 13: Comparison of number of teeth with treatment needs among various types of Community Health Workers

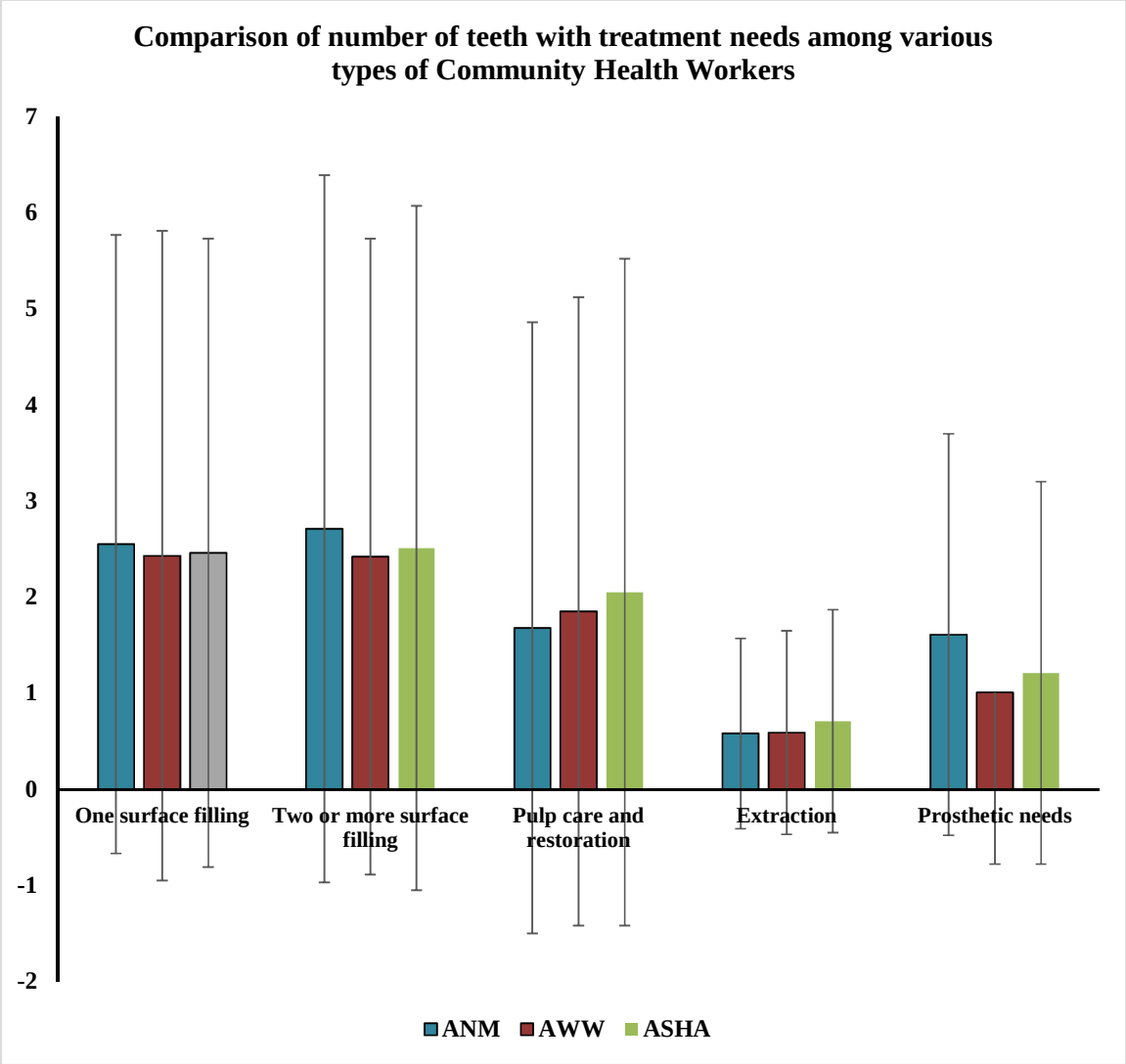


Figure 14: Oral hygiene habits among the Community Health Workers

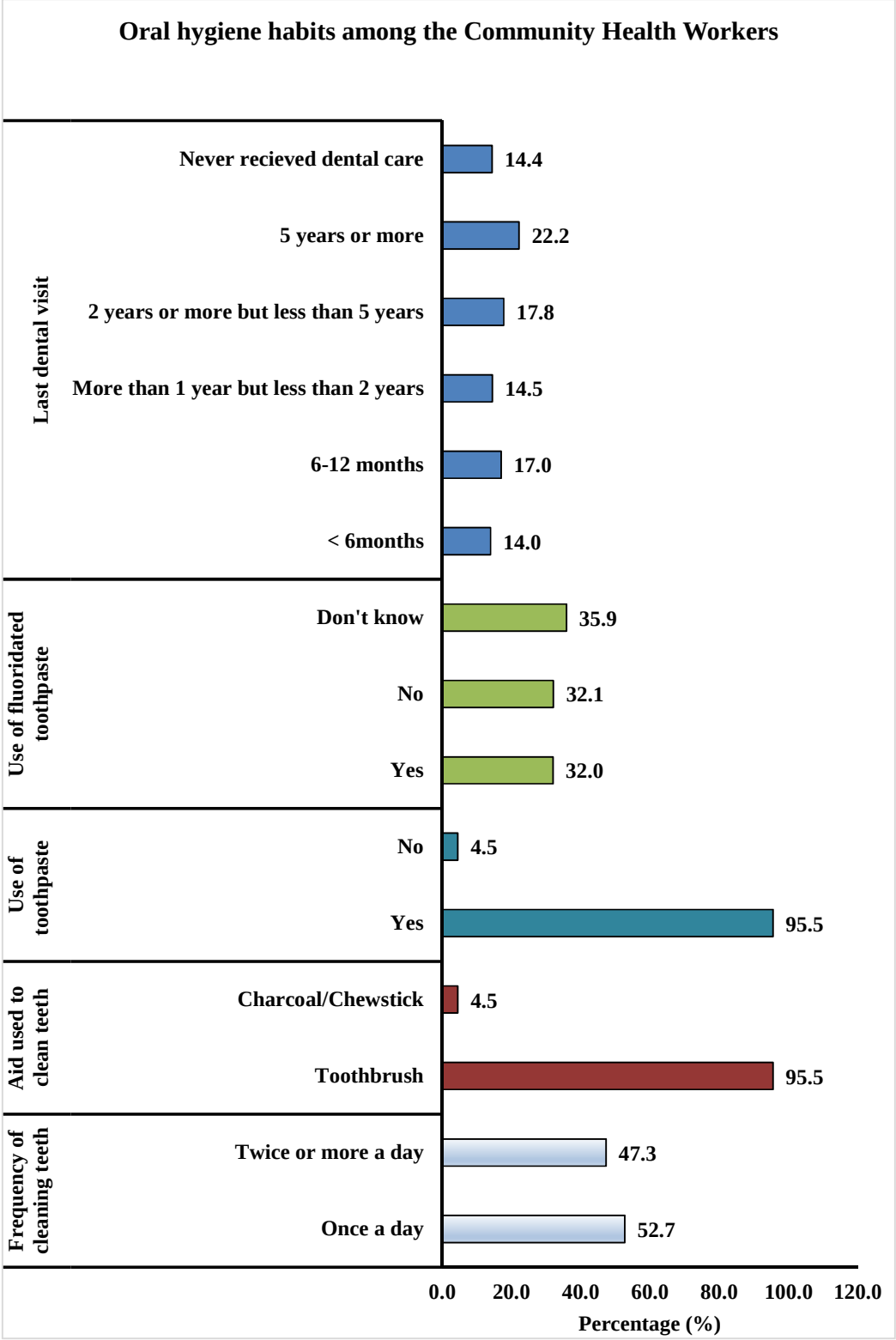
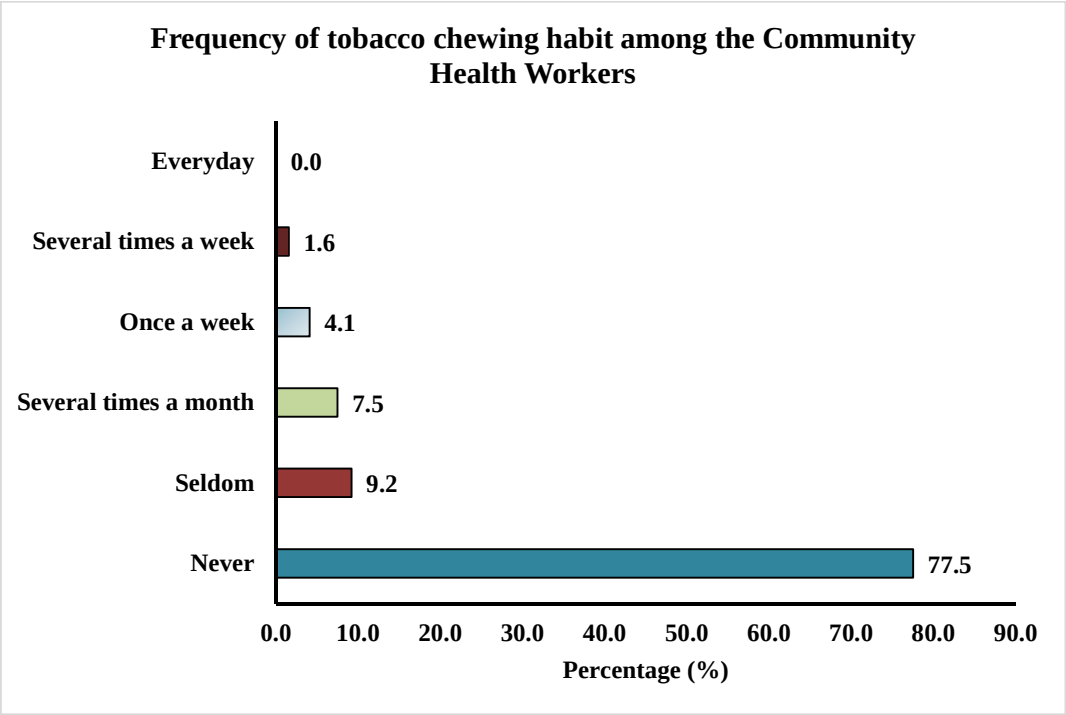


Figure 15: Frequency of tobacco chewing habits among the Community Health Workers



DISCUSSION

The present study was conducted among the CHW of Belagavi district to evaluate their oral health status and treatment needs. This population who lives among people in the community act as an interaction between healthcare system and the community. They help in creating awareness on dental health and its link with overall health. [58] Assessing the dental status of this study population will help the stake holders and the policy makers to understand the voids existing between community and oral health services especially among the rural areas.

Study population

The current study comprised of ANM, AWW and ASHA working in the PHCs, CHCs and Anganwadi centres in Belagavi district. Anganwadi Workers are part of ICDS programme introduced in the year 1975. [30] They are voluntary Workers deployed in various healthcare services like prenatal and postnatal care for pregnant women, immunization of infants and proper nutrition and growth of children. [33] On the other hand, ASHA were disseminated with NRHM in the year 2005. On integration with Ayushman Bharat Programme in 2018, they are mandated in various domains like reproductive, maternal, Infant, child and adolescent health as well as communicable and non-communicable diseases. [25] The cadre of ANM was initially launched in 1950 for maternal and child health however their role has been further extended to immunisation, family planning, national health programmes and chronic diseases. [59,60] Deploying these CHW for oral health services can be an effective strategy for combining dental health and primary health care. [61] Understanding their indispensability in the community, 729 CHW (243 in each group) in Belagavi district were recruited.

Gender

The study revealed female predominance which is owing to the assumption that usually females are recruited as CHW. As most of the tasks assigned to CHW such as reproductive, maternal and infant care are focussed towards women, females are usually preferred by women in the community. [62] A qualitative research by Alcock et. al. suggested female workers can relate the stigma and socials norms of women well and establish a friendly wrap out with them thereby effectively educate and deliver the necessary health services. [63] Also, governmental initiatives of recruiting females as CHW can be perceived as an effort to empower women in the community who volunteer to serve the community. [64] This female predominance observed in the current study was observed in similar studies. [21,46]

Age

Participants were in a wide range of age (23- 58 years) which is in accordance with the service period of Community Health Workers ie. 19-25 years to 60 which is the retirement age. To figure out the age-related differences in oral health, the participants have been classified into various age groups. Our current study revealed majority of participants belong to 30-50 years of age which is consistent to studies conducted by Khoisnam et al., [21] Shwetha et al. [46] and Aggnur et al. [24]

Oral hygiene practices

It was observed that more than half of the participants brush only once a day representing a deviation from the recommended oral hygiene practice. This is in alignment with Khoisnam et. al. [21] and Pankaj et. al. [57] but contradicts with other studies in which majority of the participants brushed twice a day. [15,24,56] Toothbrush and toothpaste was utilized by more than 90% of the participants while awareness of

using fluoridated tooth paste was observed among 32% of the participants. Comparable findings were observed among the similar studies conducted in various regions of the country. [15,21,41,56,57]

Considering the last dental visit of the study participants, 31% of them received dental treatment within a year which is comparable to that of Shwetha et. al. [46] and Aggnur et. al. [24]. 14.4 % of the CHW have not been to dentist which is lesser than that of similar studies. [15,21,41,57] This can be associated with analogous studies conducted to evaluate the usage of dental services by CHW suggesting only a meagre fraction of the participants utilized dental services. [21,46]. Anxiety, affordability, non-availability of time and dental offices in local areas and previous bad experiences were the various reasons quoted by the Community Health Workers for not utilizing dental services. [21] These findings insist upon the critical need for the implementation of strategies aimed at enhancing the accessibility of dental treatment, particularly in remote areas of the country.

Frequency of sugar intake among the Community Health Workers

The current study revealed an alarming pattern of sugar consumption in the form of fruits, juices and confectionaries among the study participants which was contradictory to the findings of similar studies where the participants believed that eating sweets can be a causative agent for dental caries and hence should be avoided. [24,56] Also, it can be noted that the participants of the current study frequently consumed tea and coffee with sugar which could be a contributing factor for the increased tooth decay. This is consistent with National Family Health Survey-4 (NFHS-4) suggesting that sugar sweetened beverages can contribute to non-communicable diseases like dental caries. [65] These insights reaffirm the importance of

creating awareness among the Community Health Workers about negative effects of eating sugar.

Caries status among the Community Health Workers

A high caries prevalence of 86.1% was reported. When age group of the study participants was considered, a notable difference with highest caries prevalence among the older group was seen. This can be corroborated with Brading et al. [66] and Bernabe et al. [67] which concluded that dental caries increases with age. This could be due to neglect of the disease at an early stage, which leads to its progression over time. On the other hand, various types of community health workers showed alike findings. The caries prevalence reported in the current study is in accordance with the findings of Khoisnam et.al., [21] Chaturvedi et. al., [37] Shwetha et. al., [46] but higher compared to that of Sajjanshetty et al. [41] and lower than that of Aggnur et al. [24]

Taking account of caries experience, DMFT score in the present study was 10.58 ± 4.68 which is larger than that of Sajjanshetty et. al. [41] and Aggnur et. al. [24] Considering the DT component, there was neither significant difference among the various age group nor types of community health Workers suggesting the carious teeth left untreated was high. Missing teeth was seen more in older group. With advancing age, long-standing dental caries often progress to root stumps or severely decayed teeth, which are eventually extracted from the oral cavity. Restorations were found to be meagre among all the age groups and types of community health Workers. This can be justified by the finding that 14.4% of the study participants never visited a dentist. Few studies conducted among the same population reported only a small portion of Community Health Workers utilized dental services. [21,46] Also, another study reported that FT score can be positively correlated with the knowledge

of the individuals suggesting that it could be low. [41] These finding asserts the need for interventions inclusive of Community Health Worker for preventive aspects.

Periodontal status

The BOP, PPD and LOA was 66.1%, 19.6% and 47.9% in the population respectively. Comparison among various age group and type of Community Health Workers revealed similar trend as dental caries with increased prevalence of BOP, PPD and LOA with increasing age and no difference among various types of Community Health Workers. This divergence is analogous to dental caries contributing to the oral disease burden. Various factors could be accounted upon this disparity such as oral hygiene practices, dietary habits and other systematic conditions. The above mentioned findings align with Khoisnam et al. [21] and Shwetha et al. [46] but vary from that of Sajjanshetty et al. [41]

Partial denture among the Community Health Workers

The current study reported a small proportion of participants (4.8%) with partial denture among the study participants. Age group wise distribution of partial denture revealed the highest (15.7%) among the older age group which can be explained by its increased caries and periodontal diseases. However, the overall prevalence of partial denture is scarce comparing to the MT component of the study participants pointing towards of non-usage of dental care and ignorance among Community health Workers. [21,46]

Dental trauma among the Community Health Workers

The present study reported 2.9% of dental trauma with the highest among 30 – 40 years of age. However, no variation was noted in the various types of Community

Health Workers. The dental trauma in the population is low which is similar to the observations of Ramachandran et. al. [68] reporting less proportion of dental trauma among females.

Dental fluorosis among the Community Health Workers

The dental fluorosis among the CHW found to be 12.3% which is lesser compared to a similar study conducted among adults in North Karnataka. [69] However, no notable variations was observed among various age groups and types of Community Health Workers.

Tobacco chewing among the Community Health Workers

A small portion presented with the habit of tobacco chewing (13.3%) with the age group > 50 years showing comparatively higher prevalence. This can be well-explained by the findings of similar studies which concluded Community Health Workers were well-aware of harmful effects of tobacco consumption. However, there was discrepancy in efforts taken by them in educating the community about the ill effects of tobacco. [27,30,31,48,49] Although, the tobacco chewing habit is minimal, it is still more than Sajjanshetty et al. [41] These findings affirm the need for interventions involving CHW in creating awareness among people.

Oral mucosal lesions among the community health Workers

Less number of lesions were found among CHW with relatively more in older group. Increased tobacco chewing habit among the same age group could be a reason for it. Among the various lesions, abscess was observed majorly followed by minor aphthous ulcer and leukoplakia. The prevalence of leukoplakia was found to be 0.5% which is consistent with the Shwetha et. al. [46] Low prevalence of lesions relates to

high awareness of the CHW about oral mucosal lesions. [27,29] Considering the location, majority were observed among Alveolar ridge or gingiva followed by buccal mucosa, vermilion border and sulci. These findings highlight that these Workers can be deployed in educational activities for the prevention of oral cancer among the community.

Treatment needs of the Community Health Workers

Teeth requiring one surface filling and two surface filling was higher when compared to that of pulp care, extraction and prosthetic needs. This implies that intervention at this stage can prevent further progress of the cavity thereby preventing disability. Highest prosthetic needs were observed among > 50 years owing to more diseased status in the same age group resulting in missing of teeth. Teeth requiring extraction and pulpal therapy was observed to be higher among 30-40 years which contradicts with Aggnur et al. [24] However, various types of the CHW showed similar trend except prosthetic needs pointing towards the non-utilisation of dental service.[21,46]

Referrals

Study participants were provided with a referral card for treatment in KLE Vishwanath Katti institute of dental sciences or its satellite centres located in various regions of Belagavi district. This initiative will motivate the study participants to report to dentist and get the appropriate treatment done. Participants with abscess were prescribed oral antibiotics and pain killers, advised to report to the dental hospital immediately for further treatment. On the other hand, participants with oral mucosal lesions were referred to KLE hospital for proper diagnosis and early intervention.

Oral health education, oral hygiene kits and referral cards with which they can avail a concession of 20% for dental treatment were provided to the study participants as an ethical obligation. They were demonstrated the proper brushing technique, five golden rules for oral health and also counselled about the ill effects of tobacco. These activities were aimed at educating these Community Health Workers on dental health.

Strengths and Limitations

A comprehensive picture on the dental health of CHW was provided being a strength of the study. Detailed findings on their dental treatment requirements will act as a foundation for framing programmes inclusive of this population by the stakeholders. The study involved a sufficiently large number of CHW which bolsters the credibility of the results. Furthermore, utilization of standardized tools like WHO Oral health proforma increases the validity of the findings. However, the present study being cross-sectional design has its innate limitations. It lacks the ability of establishing temporal association between oral diseases and its contributing factors. Although associations were observed between the variables, causal inferences could not be drawn. The lack of follow-up in the current study hindered the periodic evaluation for the participants who were given tobacco counselling. This limitation implies the need for conducting longitudinal studies among Community Health Workers. Furthermore, the restriction of study population within a narrow geographic scope limited to one district might not address the cultural and social divergences between various regions of the country hindering the generalisability of the findings. Also, usage of questionnaire for evaluating oral hygiene and deleterious habits might bring in response bias and social desirability bias impacting reliability and validity of the findings. Also, lack of follow up in the present study

FUTURE RECOMMENDATIONS

The recommendations are to heighten the oral health knowledge and status. This can be implemented by conducting oral health check-ups for early detection and comprehensive treatment for Community Health Workers. Various aspects linked with non-usage of dental treatment should be identified, addressed by making it accessible even in the remote areas of the country.

Training programms for these on dental health should be taken up, its association with overall health, proper hygiene practices, toothbrushing techniques and tobacco counselling. They are the mediators between the community and health infrastructure. By motivating them to propagate good dental health, a positive impact can be inflicted in the community. As these Workers live in the same community, they can understand the cultural and regional diversities prevailing in the community well and deliver the oral health services promptly. Especially, communities where misconceptions persist about oral health and tobacco usage, deployment of these Workers would be very well-suited for creating awareness among the population.

From research perspective, conducting longitudinal researches should be conducted to establish temporal association of oral health outcomes with various causative factors. Interventional studies can be planned involving Community health Workers targeting population such as school children, rural population and mothers to improve their oral health. Also, their functionality for finding mucosal lesions in initial stage and tobacco cessation programmes can be assessed.

CONCLUSION

This research aimed to evaluate the oral health status and treatment needs of 729 CHW in Belagavi district. Key findings were as follows:

- Majority belong to 30 – 50 years and all were females.
- Tooth decay was seen majorly in the population.
- Lesser proportion had filled teeth and underwent prosthetic rehabilitation underscoring the non-usage of facilities.
- BOP was majorly found while periodontal pocket depth and LOA was comparatively less.
- Dental trauma, dental fluorosis and oral mucosal lesions were less.
- Suboptimal level of tooth brushing and visit to dentist were found.
- Frequency of sugar consumption was found to be high with tea and coffee with sugar being the most common.
- Tobacco chewing was observed in lesser proportion of the study participants and found to be associated with dental outcomes.
- Participants requiring one surface or multiple surface filling was found to be more than that of extraction, pulpal therapy and prosthetic rehabilitation except in the elders where prosthetic need was more.
- Comparing oral health status between the different types of Community Health Workers showed no statistically significant difference except for gingival recession which was highest among the ANM. Comparing the treatment needs, a statistical difference was reported only in prosthetic needs. Oral hygiene and deleterious habits between different Community Health Workers were approximately same.

- These findings highlight that programme focussing on health education and comprehensive dental treatment including preventive strategies for the study population who play an essential role in the community.

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ANNEXURES I – ETHICAL CLEARANCE

Research and Ethics Committee
KLE VK INSTITUTE OF DENTAL SCIENCES
A Constituent Unit of KLE Academy of Higher Education & Research
Accredited 'A' Grade by NAAC | Placed in Category 'A' by MHRD (GoI)
Nehru Nagar, Belagavi - 590 010, Karnataka State
☎: 0831-2470362
FAX: 0831-2470640
Web: http://www.kledental-bgm.edu.in
E-mail:principal@kledental-bgm.edu.in

Sl. No. : 1646

CERTIFICATE

This is to Certify that the synopsis titled

Assessment of oral health status and treatment needs of Community Health workers of Belagavi district : A Cross-sectional study

Submitted by

Dr. REG. NO: IL0222002 *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
BELAGAVI.

Chairman
Research and Ethical Committee
KLEVK Institute of Dental Sciences
Belagavi

Chairman
Research and Ethical Committee
KLE VK Institute of Dental Sciences
Belgaum

ANNEXURE II- PERMISSION FROM DISTRICT HEALTH OFFICER TO CONDUCT STUDY

K L E
VISHWANATH KATTI
INSTITUTE OF DENTAL SCIENCES,
Nehru Nagar, Belagavi - 590010

KLE UNIVERSITY
EMPOWERING PROFESSIONALS

Dept of Public Health Dentistry

From.

Date:26/06/2023

REG. NO: IL0222002
Professor and Head,
Department Of Public Health Dentistry,
KLE V.K Institute of Dental Sciences,
Belagavi- 590010
Karnataka.

To,
The District Health Officer,
Belagavi
Karnataka.

(Through Proper Channel)

Sub: Permission for conducting study

Respected Sir,

This is to kindly bring to your notice that REG. NO: IL0222002 Postgraduate student from Department of Public Health Dentistry, KLE VKIDS, Belagavi would like to conduct a study entitled "**Assessment of Oral health status and Treatment Needs of Community Health Workers of Belagavi District: A Cross-Sectional Study**" among ASHA workers and Auxillary Nurse Midwives of Belagavi district. The study comprises of assessment of their oral health status, distribution of questionnaire and collection of oral health data. Kindly Provide Permission For the same.

Thanking You.

Professor and Head
Department of Public Health Dentistry
KLE VKIDS

Professor & Head
Department of Public Health Dentistry
KLE VK Institute of Dental Sciences
Nehru Nagar, Belagavi-10.

ANNEXURE III- PERMISSION FROM DISTRICT HEALTH OFFICER TO CONDUCT STUDY

KLE V.K. Institute of Dental Sciences
(A Constituent unit of KLE Academy of Higher Education & Research
Deemed-to-be-University u/s 3 of the UGC Act, 1956)
Nehru Nagar, Belagavi-590 010 INDIA
Accredited 'A+' grade by NAAC (3rd Cycle) & Placed in Category 'A' by MHRD (GoI)
☎: 0831-2470362 Web: http://www.kledental-bgm.edu.in
FAX: 0831-2470640 **E-mail:principal@kledental-bgm.edu.in**

Date:

From.
REG. NO: IL0222002
Professor and Head,
Department Of Public Health Dentistry,
KLE V.K Institute of Dental Sciences,
Belagavi- 590010
Karnataka.

To,
The Deputy Director,
Department of Women and Child Development,
Belagavi
Karnataka.

(Through Proper Channel)

Sub: Permission for conducting study

Respected Sir,

This is to kindly bring to your notice that **REG. NO: IL0222002** :tgraduate student from Department of Public Health Dentistry, KLE VKIDS, Belagavi would like to conduct a study entitled **"Assessment of Oral health status and Treatment Needs of Community Health Workers of Belagavi District: A Cross-Sectional Study"** among Anganwadi workers of Belagavi district. The study comprises of assessment of their oral health status, distribution of questionnaire and collection of oral health data. Kindly Provide Permission For the same.

Thanking You.

Professor & Head
Department of Public Health Dentistry
Professor & Head
Dept. of Public Health Dentistry
KLE VK Institute of Dental Sciences
Nehru Nagar, Belgaum-10

Professor and Head
Department of Public Health Dentistry
KLE VKIDS

To
We are giving permission
To conduct the survey.

ANNEXURE IV- CONSENT FORM

KAHER'S KLE V.K. INSTITUTE OF DENTAL SCIENCES

DEPARTMENT OF PUBLIC HEALTH DENTISTRY

Date:

I, **REG. NO: IL0222002** asking for your volunteered participation in my study entitled **"Assessment of Oral Health Status and Treatment Needs of Community Health Workers of Belagavi District: 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 survey, feel free to contact.

Primary Investigator: REG. NO: IL0222002 (Dental postgraduate student), KAHER'S KLE V.K. Institute of Dental Sciences, Belagavi.

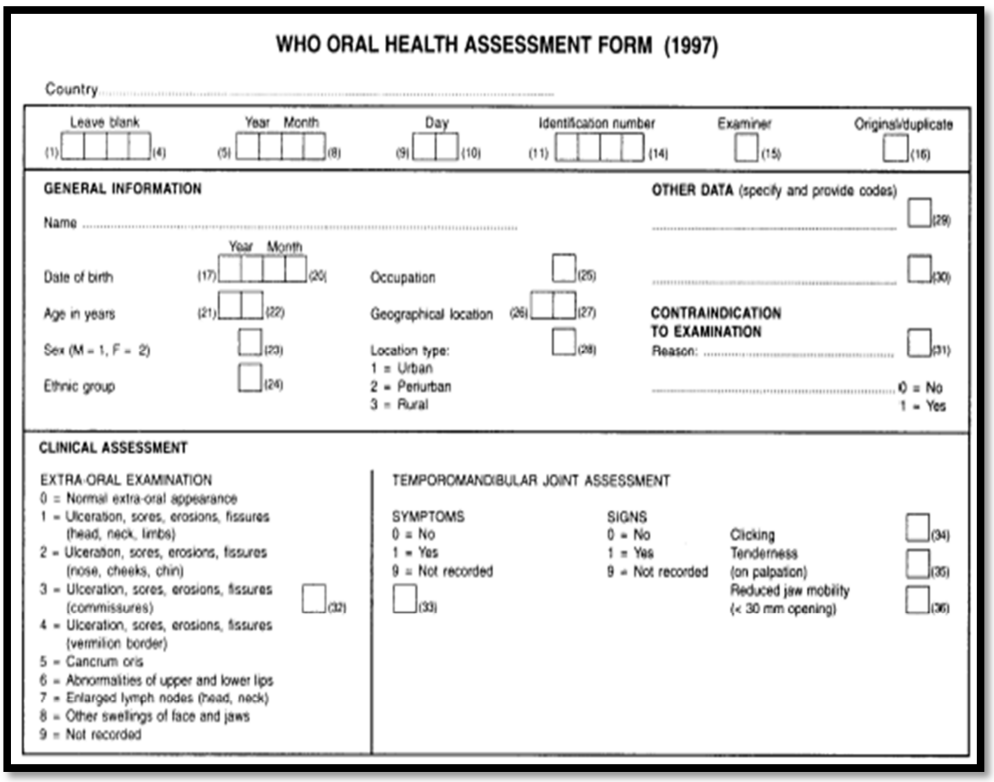
Voluntary Participation: Participation in the study is completely voluntary. If you decide not to participate, there will be no negative consequences. Kindly be aware that if you decide to participate, you may stop participating at any given point of time, and you may decide not to answer any specific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

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

Witness:

(Signature) (Signature)

ANNEXURE V-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 (17) Year Month (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

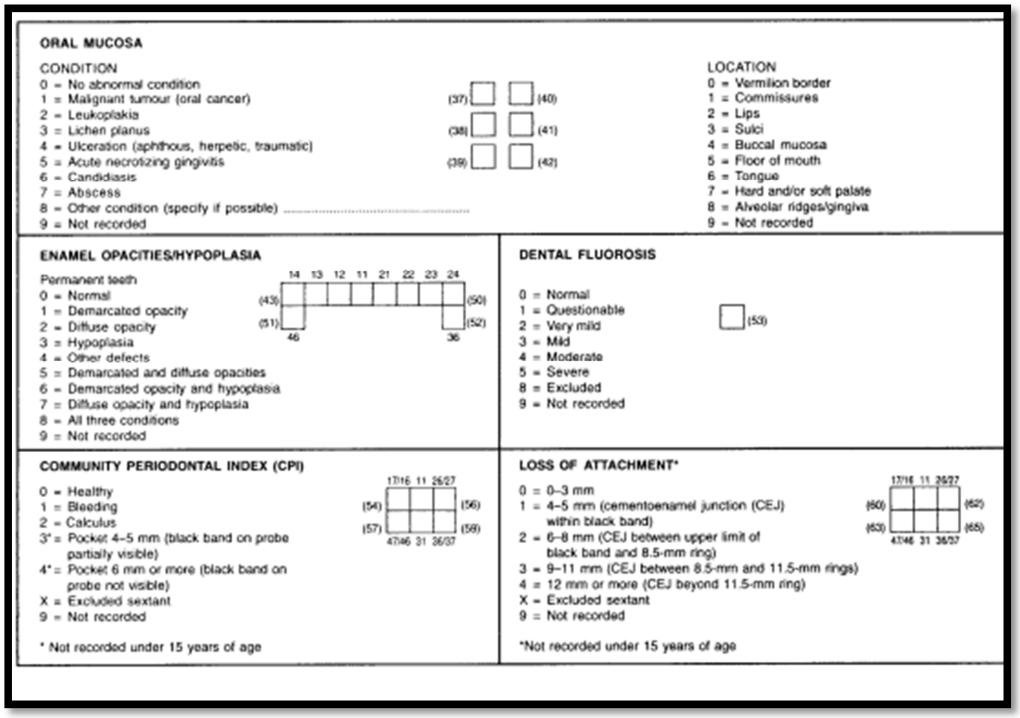
EXTRA-ORAL EXAMINATION
0 = Normal extra-oral appearance
1 = Ulceration, sores, erosions, fissures (head, neck, limbs)
2 = Ulceration, sores, erosions, fissures (nose, cheeks, chin)
3 = Ulceration, sores, erosions, fissures (commissures) (32)
4 = Ulceration, sores, erosions, fissures (vermilion border)
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
0 = No
1 = Yes
9 = Not recorded
(33)

SIGNS
0 = No
1 = Yes
9 = Not recorded

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



ORAL MUCOSA

CONDITION
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

(37)(40)
(38)(41)
(39)(42)

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

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

(53)

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*

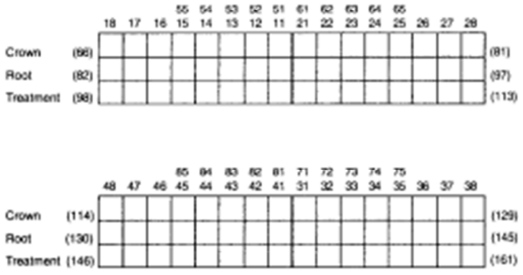
0 = 0–3 mm
1 = 4–5 mm (cementoenamel junction (CEJ) within black band)
2 = 6–8 mm (CEJ between upper limit of black band and 8.5-mm ring)
3 = 9–11 mm (CEJ between 8.5-mm and 11.5-mm rings)
4 = 12 mm or more (CEJ beyond 11.5-mm ring)
X = Excluded sextant
9 = Not recorded

*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/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
—	8	8	Unerupted tooth, (crown)/unexposed root	6 = Extraction
T	T	—	Trauma (fracture)	7 = Need for other care (specify).....
—	9	9	Not recorded	8 = Need for other care (specify).....
				9 = Not recorded

PROSTHETIC STATUS

Upper (162) Lower (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 (164) Lower (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

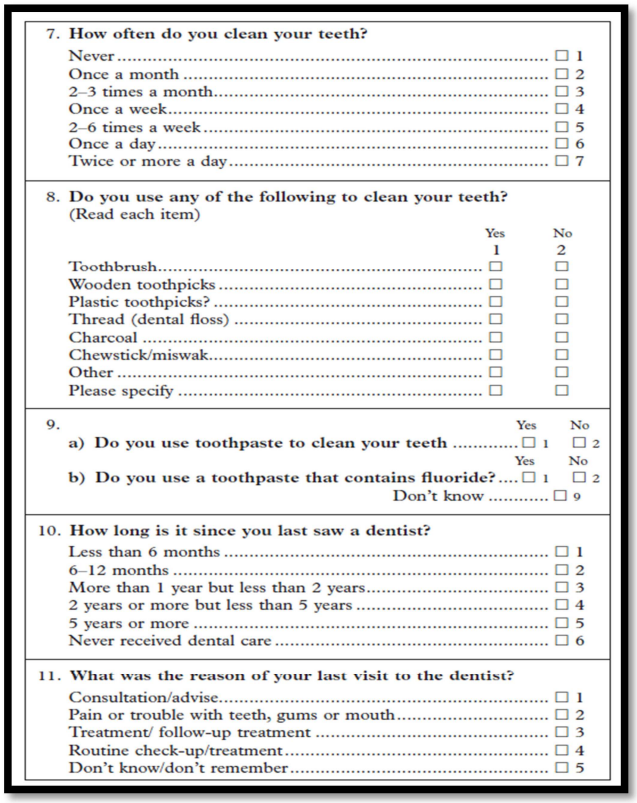
Life-threatening condition (177)
Pain or infection (178)
Other condition (specify)..... (179)

0 = Absent
1 = Present
9 = Not recorded

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

NOTES

ANNEXURES VI– WHO ORAL HEALTH QUESTIONNAIRE FOR ADULTS 2013



7. **How often do you clean your teeth?**

Never	☐ 1
Once a month	☐ 2
2–3 times a month	☐ 3
Once a week	☐ 4
2–6 times a week	☐ 5
Once a day	☐ 6
Twice or more a day	☐ 7

8. **Do you use any of the following to clean your teeth?** (Read each item)

	Yes 1	No 2
Toothbrush	☐	☐
Wooden toothpicks	☐	☐
Plastic toothpicks?	☐	☐
Thread (dental floss)	☐	☐
Charcoal	☐	☐
Chewstick/miswak	☐	☐
Other	☐	☐
Please specify	☐	☐

9.

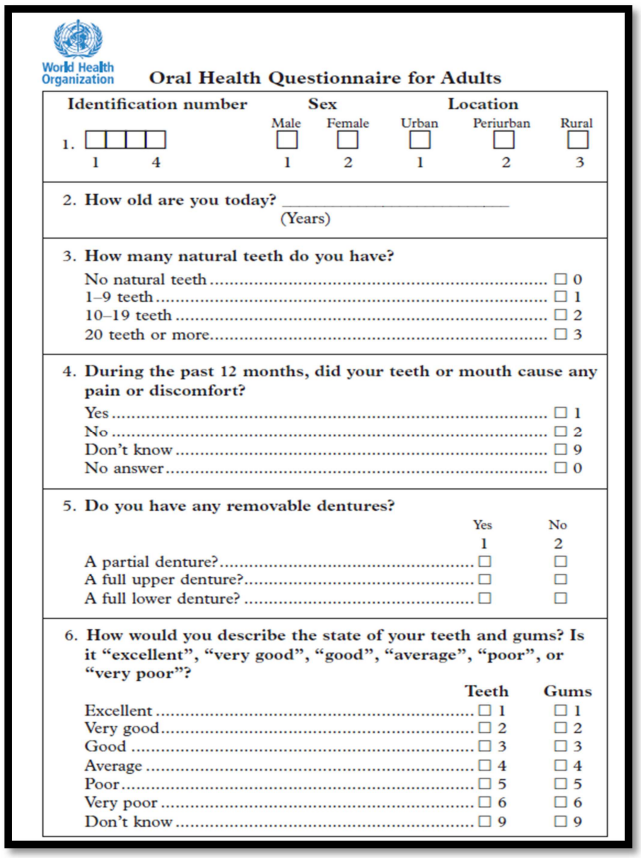
	Yes	No
a) **Do you use toothpaste to clean your teeth**	☐ 1	☐ 2
b) **Do you use a toothpaste that contains fluoride?**	☐ 1	☐ 2
Don't know	☐ 9	

10. **How long is it since you last saw a dentist?**

Less than 6 months	☐ 1
6–12 months	☐ 2
More than 1 year but less than 2 years	☐ 3
2 years or more but less than 5 years	☐ 4
5 years or more	☐ 5
Never received dental care	☐ 6

11. **What was the reason of your last visit to the dentist?**

Consultation/advise	☐ 1
Pain or trouble with teeth, gums or mouth	☐ 2
Treatment/ follow-up treatment	☐ 3
Routine check-up/treatment	☐ 4
Don't know/don't remember	☐ 5



World Health Organization

Oral Health Questionnaire for Adults

Identification number	Sex		Location		
	Male	Female	Urban	Periurban	Rural
1. ☐☐☐☐	☐	☐	☐	☐	☐
1 4	1	2	1	2	3

2. **How old are you today?** _____ (Years)

3. **How many natural teeth do you have?**

No natural teeth	☐ 0
1–9 teeth	☐ 1
10–19 teeth	☐ 2
20 teeth or more	☐ 3

4. **During the past 12 months, did your teeth or mouth cause any pain or discomfort?**

Yes	☐ 1
No	☐ 2
Don't know	☐ 9
No answer	☐ 0

5. **Do you have any removable dentures?**

	Yes 1	No 2
A partial denture?	☐	☐
A full upper denture?	☐	☐
A full lower denture?	☐	☐

6. **How would you describe the state of your teeth and gums? Is it "excellent", "very good", "good", "average", "poor", or "very poor"?**

	Teeth	Gums
Excellent	☐ 1	☐ 1
Very good	☐ 2	☐ 2
Good	☐ 3	☐ 3
Average	☐ 4	☐ 4
Poor	☐ 5	☐ 5
Very poor	☐ 6	☐ 6
Don't know	☐ 9	☐ 9

12. **Because of the state of your teeth or mouth, how often have you experienced any of the following problems during the past 12 months?**

	Very often	Fairly often	Some-times	No	Don't know
	4	3	2	1	0
(a) Difficulty in biting foods	☐	☐	☐	☐	☐
(b) Difficulty chewing foods	☐	☐	☐	☐	☐
(c) Difficulty with speech/trouble pronouncing words	☐	☐	☐	☐	☐
(d) Dry mouth	☐	☐	☐	☐	☐
(e) Felt embarrassed due to appearance of teeth	☐	☐	☐	☐	☐
(f) Felt tense because of problems with teeth or mouth	☐	☐	☐	☐	☐
(g) Have avoided smiling because of teeth	☐	☐	☐	☐	☐
(h) Had sleep that is often interrupted	☐	☐	☐	☐	☐
(i) Have taken days off work	☐	☐	☐	☐	☐
(j) Difficulty doing usual activities	☐	☐	☐	☐	☐
(k) Felt less tolerant of spouse or people who are close to you	☐	☐	☐	☐	☐
(l) Have reduced participation in social activities	☐	☐	☐	☐	☐

13. **How often do you eat or drink any of the following foods, even in small quantities?**
(Read each item)

	Several times a day	Every day	Several times a week	Once a week	Several times a month	Seldom /never
	6	5	4	3	2	1
Fresh fruit	☐	☐	☐	☐	☐	☐
Biscuits, cakes, cream cakes	☐	☐	☐	☐	☐	☐
Sweet pies, buns	☐	☐	☐	☐	☐	☐
Jam or honey	☐	☐	☐	☐	☐	☐
Chewing gum containing sugar	☐	☐	☐	☐	☐	☐
Sweets/candy	☐	☐	☐	☐	☐	☐
Lemonade, Coca Cola or other soft drinks	☐	☐	☐	☐	☐	☐
Tea with sugar	☐	☐	☐	☐	☐	☐
Coffee with sugar	☐	☐	☐	☐	☐	☐

(Insert country-specific items)

14. **How often do you use any of the following types of tobacco?**
(Read each item)

	Every day	Several times a week	Once a week	Several times a month	Seldom	Never
	6	5	4	3	2	1
Cigarettes	☐	☐	☐	☐	☐	☐
Cigars	☐	☐	☐	☐	☐	☐
A pipe	☐	☐	☐	☐	☐	☐
Chewing tobacco	☐	☐	☐	☐	☐	☐
Use snuff	☐	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐	☐

Please specify _____

15. **During the past 30 days, on the days you drank alcohol, how many drinks did you *usually drink per day*?**

Less than 1 drink	☐ 0
1 drink	☐ 1
2 drinks	☐ 2
3 drinks	☐ 3
4 drinks	☐ 4
5 or more drinks	☐ 5
Did not drink alcohol during the past 30 days	☐ 9

16. **What level of education have you completed?**

No formal schooling	☐ 1
Less than primary school	☐ 2
Primary school completed	☐ 3
Secondary school completed	☐ 4
High school completed	☐ 5
College/university completed	☐ 6
Postgraduate degree	☐ 7

(Insert country-specific categories)

That completes our questionnaire
Thank you very much for your cooperation!

Year	Month	Day	Interviewer	District	Country
☐☐	☐☐	☐☐	☐☐	☐☐	☐☐☐