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Abstract

The oral diseases affect nearly 3.9 billion people globally. Despite the efforts of government of Rwanda to achieve the 3rd sustainable development goal, in 2019, 'tooth and gum disease' ranked as the most commonly recorded complaint at district hospitals in Rwanda. This study was conducted to assess knowledge, attitude and practice (KAP) towards oral hygiene among adult patients in Muhima District Hospital. The study on oral health knowledge, attitude and self-care practice were help the public health administrators and policy makers in specification of oral health policies to develop behavioral modifications strategies relevant to this area. The findings of this study were generating evidence that were form a basis to rely on by future researchers. This study was an academic merit to the researcher. A total of 322 adult patients who attended Muhima District Hospital during the study period were employed using a total sampling technique. Pretested questionnaire was used to collect data. Data was entered into SPSS version 26 for analysis. Bivariate and multivariable logistic regressions were employed to identify an association between the independent and dependent factors. Multivariate analysis was conducted to see the adjusted associations. Among adult patients with 35 years old and above who were attending Dental service Muhima District Hospital, the total score for oral hygiene knowledge was 61.5%, attitudes toward oral hygiene were 62.4%, and good oral hygiene practices were 77%.The odds of good oral hygiene practice were 2.20 times (AOR; 2.25: 95% C.I.; 0.76-2.46) more among urban place of residence compared to those from rural areas. Patients who knew a twice-daily tooth brushing were 2.25 times (AOR; 2.25: 95% C.I. 1.25-4.05) more likely to have good oral hygiene practices than those who did not. The odds of good oral hygiene practices were 1.85 times (AOR; 1.85: 95% C.I. 1.04-3.28) and 2.08 times (AOR; 1.85: 95% C.I. 1.09-3.99) more among those who believe that brushing teeth once per day is not enough and among individuals who had good knowledge on oral hygiene compared to their counterparts respectively and the association was found significant. In this study, no association was identified between positive attitude towards oral hygiene and good oral hygiene practices with a P-value =0.112. The study identified a significant knowledge gap in oral hygiene among adult patients at Muhima District Hospital. Factors like residence and knowledge of recommended daily tooth brushing were linked to oral hygiene practices. Interventions emphasizing regular brushing, especially in rural areas, and enhancing overall

oral health awareness are crucial. The findings underscore a need for improved oral hygiene routines and regular dental check-ups.

Keywords: *Knowledge, Attitude, Practice, Oral Hygiene, Adult Patients Attending Dental Service, Muhima District Hospital, Rwanda*

1. Introduction

Oral hygiene, as defined by the World Health Organization (WHO), is a state of being free from various oral and facial issues such as pain, cancer, infections, gum disease, tooth decay, and tooth loss (WHO, 2023). The intricate connection between oral health and general well-being is apparent, as conditions like dental caries and periodontal diseases persist globally. Poor oral hygiene is not only associated with major non-communicable diseases like heart diseases and diabetes but also plays a role in the etiology of oral cancer (Duangthip, 2020). The global prevalence of oral diseases is increasing, fueled by factors such as urbanization, inadequate fluoride exposure, and limited access to oral health care, particularly in developing communities (Okello, 2022).

In developing countries, the high prevalence of oral diseases is attributed to neglect, resource scarcity, poor knowledge, and negative attitudes (WHO, 2023). Knowledge about oral health is deemed crucial for adopting healthy practices, although cross-sectional studies suggest a weak association between knowledge and behavior (Al-Zarea, 2013). Nevertheless, increased knowledge has demonstrated an association with better oral health outcomes (Jaber, 2017). However, dental and periodontal diseases are on the rise in Sub-Saharan Africa, especially among underprivileged populations, due to limited access to affordable oral health services (Kabali, 2018; WHO, 2023). In Rwanda, dental and gum diseases rank high in morbidity, emphasizing the need for comprehensive oral health strategies (Mukabizimana, 2019).

Despite the significant burden of oral diseases, their largely preventable nature underscores the importance of assessing knowledge, attitudes, and practices related to oral hygiene among adults. Implementing evidence-based preventive interventions, especially in hospital settings where adults seek healthcare, can contribute to improved oral health outcomes (Selvaraj, 2021). The Rwandan Ministry of Health has recognized this need and developed the National Oral Health Strategic Plan to integrate oral health services and expand accessibility (Ministry_of_Health, 2019). Understanding and addressing oral hygiene among adults are critical not only for promoting oral health but also overall well-being.

Globally, nearly 3.9 billion people are affected by oral diseases (WHO, 2023), and in Rwanda, dental and gum diseases are prevalent, ranking among the top causes of morbidity for adult patients at each level of healthcare (Ministry_of_Health, 2019). At least 64.9% of the Rwandan population has experienced dental caries, highlighting the need for oral health interventions (National Institute of Statistics of Rwanda, 2016; Mukabizimana, 2019). Oral health education, a positive attitude, and good oral health practices have been shown to reduce the incidence of oral diseases (Selvaraj, 2021). However, literature on the knowledge, attitude, and practices (KAP) of the population regarding oral hygiene in Rwanda remains scarce. Therefore, there is an urgent need for a KAP survey on oral hygiene among adult patients in both rural and urban communities, prompting the initiation of this study at Muhima District Hospital, which offers functional dental services accessible to the population of Nyarugenge District across different economic strata.

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1.1 Objectives of the study

1.1.1 General objective

The general purpose of this study was to assess knowledge, attitude and practice towards oral hygiene among adult patients attending dental service in Muhima district hospital of Rwanda.

1.1.2 Specific objectives

(i) To determine knowledge level about oral hygiene among adult patients attending dental service in Muhima district hospital of Rwanda

(ii) To assess the attitude towards oral hygiene among adult patients attending dental service in Muhima district hospital of Rwanda

2. Empirical literature

2.1 Knowledge of adult patients towards oral hygiene

Numerous studies have been carried out to assess patients' knowledge regarding oral hygiene and related medical issues. For instance, According to a Japanese study, dental clinics represented the majority of sources (> 50%) of oral hygiene knowledge while another survey from a different Japanese institution reveals that 1,266 students (57.0%) learned about dentistry from dental clinics, with school and television coming in second and third, respectively, at 39.2%, (29.1%) and 1.6% and found that frequent dental examinations and the usage of dental floss were strongly correlated with dental clinics as a source of dental knowledge(Taniguchi-Tabata et al., 2017). The results of study conducted in Saudi Arabia indicated that 332 (64%) female participants and 174 (60%) male participants had perception and knowledge of the use of dental floss or any other device to clean between their teeth, while 174 (48.50%) male participants and 174 (49.10%) female participants cleaned their tongue with the same brush, rather than using a tongue scrubber or any other aids(Alshahrani et al., 2021). And the study conducted in Egypt reported 3.4% never visited a dentist, 34.5% visited six months ago, 27.7% visited a year ago, 13.4% visited two years ago and 3.4% visited a dentist more than two years ago from their study among medical student in Egypt(Al-Zarea, 2013)

In Sub-Saharan Africa, gaps in knowledge, cultural beliefs or patterns of behavior affects oral hygiene among the population. For example, in a study that was conducted in Uganda in 2021, the majority (86%) of the respondents knew about oral health and this implied that awareness of oral hygiene was relatively good because oral and dental health is part of the health education talks which are offered in health facilities (Okello, 2022). In regards to sources of information, studies indicate that most of respondents obtained information about oral health from dentists. This was attributed to the health-seeking behaviors about certain communities and perhaps they got a chance to obtain information about oral hygiene from the health workers during the health education and talks at health facilities (Bhuiyan, 2020). Another study that was conducted among adults in Nigeria indicated that the sources of information about oral health revealed that dentists were the main source of oral health information for adult Nigerians (Akinyamoju, 2018). In a study that was conducted in Ethiopia, patients were aware of existence of dental caries but the majority (74.0%) didn't know its etiology and associated factors in adults. However, among the respondents who had acquired some knowledge from various educational institutions and also from the health education given at the health facilities, the majority (92%) reported that they knew the causes(Bogale et al., 2021). This shows that educational level and individual experiences were the predictors of good knowledge about oral hygiene. Generally, adult patients were found to have poor knowledge about oral hygiene.

In a study that was conducted in Vezo Hospital in the rural village of Andavadoaka, Madagascar, about the knowledge of almost half of the hospital patients (47.4%) reported to have received information regarding oral health i.e. brushing teeth in schools. The second most

common source was relatives (22.4%) followed by dentist/hospital (13.2%). A vast majority had good knowledge about the preventive effect of teeth cleaning, 84.2% agreed with the fact that brushing teeth can prevent tooth decay. 81.6% answered that regular visit can keep away dental problems. Even though 27.7% of the patients weren't aware of the fact that tooth brushing can prevent periodontal diseases, the majority (72.3%) knew that tooth brushing had a preventive effect against it. Many patients were aware of the risks of consuming foods and drinks containing sugar and their detrimental effect on oral health, 84.2% knew that eating and drinking sweet things can cause tooth decay. Nearly all the participants (94.7%) didn't know what fluoride is (Scaglia, 2017).

2.2 Attitude of adult patients towards oral health

Globally, attitude towards oral health differ depending on the attitude of the population in certain part of the world. In all countries, Tooth brushing is the main oral hygiene behavior, it is widely associated to good oral health (WHO, 2023). In developed countries there is routine three time a day brushing behavior while in developing countries most people do not perform it thoroughly enough to prevent accumulation of dental plaque and this was linked to their negative attitude towards oral hygiene (Akinyamoju, 2018). Most oral hygiene interventions are based on motivation and development of aptitude. Regarding to the attitude of the patients, the attitude was directly related to the level of knowledge (Cattoni, 2021). This finding concurs with submissions of Vincent *et al*., 2017 who reported that 87.6% had positive attitude and 12.4% had negative attitude towards oral health among antenatal clinic attendees in public secondary health facilities in Benin City, Nigeria. According the study conducted by Bashiru & Omotola, (2016) at the University of Port Harcourt, Nigeria, This indicates that although about 60% of the students showed positive attitude toward oral health care, 35% of the students showed negative oral health behavior. In a study that was conducted in Vezo Hospital in the rural village of Andavadoaka, Madagascar, about the attitude Only 8 participants found it less important or not important at all to take care of their teeth. In total, 68 patients answered important to very important (50.0% very important, 39.5% important). The most frequent reason (40.8%) for avoiding dental visits was the long distance to the clinic. The second most common answer was the fear of possible pain, 27.6%. The majority 73.6% of the patients sought dental help only when they experienced pain. Occasionally and often (62.7%) were the two most common answers regarding oral discomfort while rare occasions of oral discomfort in the last year was an infrequent answer (12.0%) (Scaglia, 2017).

In East Africa, the prevalence of oral hygiene health conditions related to negative attitude was 27.8% in Kenya (Kenya Ministry of Health, 2015) and 32.5% in Uganda (Kutesa, 2015). However, no local study was found to have assessed the adult patients' attitude towards oral hygiene in the current study setting.

2.3 Practice of adult patients towards oral health

Globally, the practice of oral hygiene is documented in literature in two parts. The practice of oral hygiene at home and the practice of visiting dentist and all correlated to the knowledge of the respondents. For instance, a study conducted on 478 participants in Brazil revealed that only 112 (23.68%) was found to have visited a dentist; 67.77% of those who had seen the dentist for preventive care, the majority (63.11%) used public rather than private services. The use of dental services varied according to parental socioeconomic status where children from low socioeconomic backgrounds and those whose parents rated their oral health as "poor" used dental services less frequently. The rationale for visiting the dentist also varied with

socioeconomic status, in that children of parents with poor socioeconomic status and who reported their child's oral health as "fair/poor" were less probable to have visited the dentist for preventive care (Machry, 2013). Regarding the material used for cleaning study that was conducted in Terna Dental College and Hospital, Navi, Mumbai indicates that the majority (96%) of the respondents reported that they cleaned their teeth using toothbrushes as the most available tool for oral hygiene (Kapoor, 2014). Regarding to the dentist visit, studies indicate the unsatisfactory practice toward oral health and hygiene. For instance, one study showed adequate knowledge but poor attitude regarding oral health as half of the study population never visited dental clinics and 31.5% have visited between 2 to 5 years, only 3% had visited for routine checkups while 73% of them were afraid of going to the dentist (Bala, 2018). In India, more than 95% used toothbrush and paste and, 77.6% of respondents brush their teeth morning and night (Mukabizimana, 2019).

In Africa, a study conducted in Nigeria, less than two-thirds of the sample (63.3%) cleaned their teeth at least twice daily and none of the participants used interdental cleaning aids (Umanah, 2017). One research conducted in Sudan among 398 randomly selected pupils found that around 79% of pupils brush their teeth in the morning and evening, and the use of toothbrush and toothpaste was reported by 93.7% of the respondents (Sirag, 2016). Different findings were found in Madagascar in 12-year old school children where only 8.6% reported cleaning their teeth twice per a day and more with 55.1% cleaning their teeth once per day and 36.2% reporting cleaning their teeth less than once per day (Mukabizimana, 2019). This study also revealed that only 65.7% used toothbrush to clean their teeth and others used other items such as charcoal, miswak, fingers and others while only 68.6% used toothpaste while cleaning their teeth. In Madagascar, only 5.7% schoolchildren clean their teeth for more than 2 minutes and 38.6% used 2 minutes to clean their teeth and and 57.9% of the respondents cleaned their teeth at least once a day. One third of the participants did it twice per day. The time spent cleaning teeth was in 64.0% of the cases less than 2 minutes. Regarding the tools used for cleaning, the most common was toothbrush, 71.1%. The second most common method was fingers (10.5%). Among patients that reported "Other" as answer there were three more tools used: grass, sand with water and soap. 66.7% reported to use toothpaste while brushing (Scaglia, 2017).

In East Africa, practice of oral hygiene such us tooth brushing was not commonly used in Ethiopia, where one study revealed that 67.6% of children clean their teeth using small stick of wood (Mulu, 2014). Regarding the time spent during tooth brushing, Suprabha and collaborators (Suprabha, 2013), found that more than a half (63.8%) of the respondents reported brushing their teeth for more than 3 minutes and 34.8% reported brushing teeth for less than 3 minutes. In another study conducted in Uganda, most (58%) of the respondents reported that they cleaned their teeth twice a day and the oral hygiene practices were appropriate to the respondents' knowledge and attitude towards oral hygiene regarding their socioeconomic status (Okello, 2022). Similarly in Rwanda, one cross-sectional study was conducted in urban primary school children and found that 80.5% used toothbrush and toothpaste and 70.8% brush their teeth at least twice a day (Mukabizimana, 2019). However, no study conducted in Rwanda assessing the practice of oral hygiene among adult patients.

2.3 Research Gap

Numerous studies were conducted in different countries around the world regarding knowledge, attitude and practice towards oral health among school children, and adult patients. One study was conducted in Rwanda assessing factors associated with oral health status and treatment needs but was conducted among primary school children with much more focus on

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their risk behaviors and dental health practices awareness. No published study was conducted on Knowledge, attitude and practice towards oral hygiene in a general public District Hospital (DH) like Muhima DH. Therefore, this study was assess Knowledge, attitude and practice towards oral hygiene among adult patients attending Muhima District Hospital.

2.5 Conceptual framework

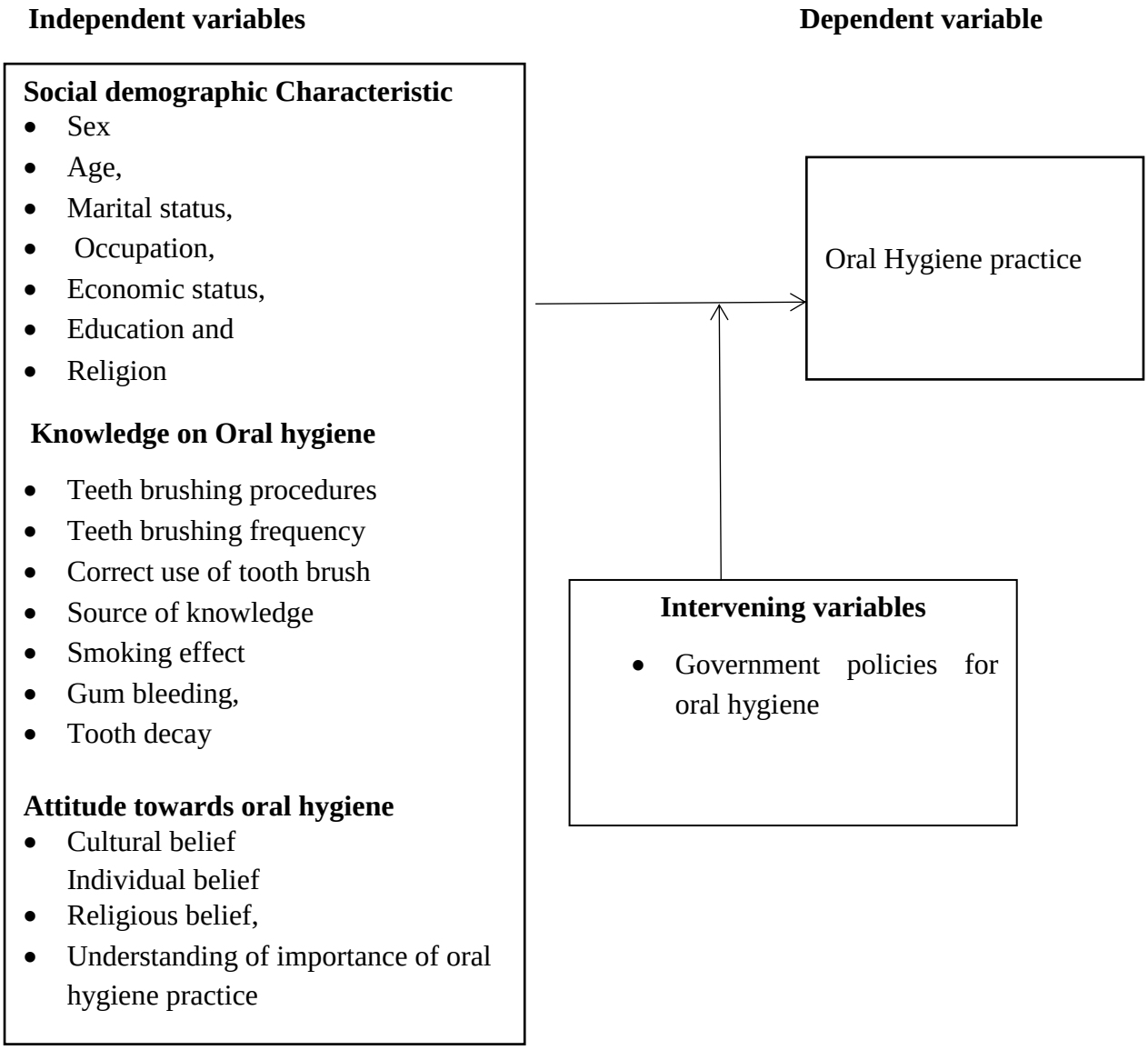

Figure 1. Conceptual framework

Source: Researcher, 2023

This part clearly explains different dimensions of this study. As it is shown in the diagram various variables come together. It connects the various variables (dependent, independent, and intervening) and their inter-relationships. As it is mentioned in the figure 1, in this study the population is adult patients attending Muhima District Hospital and independent variables are Social demographic characteristics, Knowledge, and Attitudes towards Oral hygiene while the dependent variable is oral hygiene practice. There are intervening variables like National plans for oral hygiene that can alter practice of oral hygiene among those patients. Regarding

independent variables, knowledge of adult patients can affect the practice of oral hygiene in the essence that the higher is the knowledge is the higher is the practice. This study were assess knowledge variables such as teeth brushing procedures and frequency, Attitude variables such as understanding of importance of oral hygiene practice and practice variables such as teeth brushing habit and routine visit of a dentist.

3. Materials and Methods

This study employed a quantitative cross-sectional design, suitable for assessing outcomes and independent variables at a single point in time, particularly effective for population-based surveys and prevalence assessments (Maninder, 2016). The research was conducted at Muhima Hospital in Nyarugenge District, City of Kigali, Rwanda, a public hospital providing maternal-child care and overseeing 10 functional health centers, serving a population of 318,581 individuals (Muhima District Hospital, 2023).

The study targeted adult outpatients attending the dental service at Muhima District Hospital during a one-month period, with the annual target population being 4,200 patients (Muhima District Hospital, 2023). Inclusion criteria involved individuals aged 35 years and above voluntarily attending the dental service, while those with mental disorders or unwilling to participate were excluded. A total population sample strategy was employed, including all adult outpatients aged 35 and above who voluntarily agreed to participate in the study during October 2023. Every consecutive case present in the dental service department at Muhima District Hospital was interviewed.

Data were collected using an interviewer-administered pretested questionnaire, developed in English based on specific study objectives and later translated into Kinyarwanda for better participant understanding. A dental model borrowed from the World Health Organization was utilized to observe participants' oral hygiene practices. Reliability and validity of the instruments were ensured through a test-retest reliability method involving 10 random participants in separate occasions. Ten participants were considered sufficient for reliability testing when measured at different occasions. The tools were deemed reliable if consistently reproducing the same result over all visits. Validity was assessed through pretest pilot studies on 10 participants from the nearest Muhima Health Center, employing criterion-related, content, and construct validity test methods.

Data were analyzed using SPSS software version 25, involving descriptive analysis with tables and graphs presenting frequency and percent for categorical variables. Mean and standard deviation were used for quantitative descriptive information. Chi-square tests assessed factors associated with knowledge, attitude, and practice of participants toward oral hygiene, while multivariate logistic regression analyses identified factors associated with oral hygiene after adjustment. Ethical considerations included seeking permission from the Mount Kenya University Institutional Review Board and obtaining permission from the General Director of Muhima District Hospital. Informed consent was obtained from participants, ensuring confidentiality, and data were accessible only to the research team. The study carried no risk for participants, and participation benefits included access to affordable oral health services..

4. Results

4.1 Demographic characteristics of respondents

This section presents the demographic information of the respondents participated in this research. It is composed of participants' age, sex, marital status, education level, occupation, religion, ubudehe category, and place of residence. Detail sociodemographic characteristics of

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all are presented in Table 4.1. The outcomes presented in table 4.1 indicated that among the adult patients attending Muhima District Hospital in October 2023, the mean age of participants was 50.9(9.83SD) years, with majority 114(35.4%) were within the age range of 35-45 years. The majority 174(54.0%) were female and the majority of respondents to Marital status were Married with 276(85.7%). The majority of respondents in education level were in primary grade 6 representing 147(45.7%) of the total. A big number of respondents 114(35.4%) were Catholics followed by 84 participants (26.1%) from Protestants churches. According to Ubudehe Category and Place of residence the majority respondents were Third CAT and Rural with 50.6% and 76.7%, respectively.

Table 4. 1: Socio demographic characteristics of study participants

Variables		Frequency	Percent
Age of respondents			
	35-45 Years	114	35.4
	46-55 Years	99	30.7
	56-65 Years	78	24.2
	66-55 Years	31	9.6
Sex of respondent			
	Male	148	46
	Female	174	54
Marital status			
	Single	7	2.2
	Widow	13	4
	Divorced	26	8.1
	Married	276	85.7
Education level			
	Illiterate	11	3.4
	Primary	147	45.7
	Secondary	136	42.2
	University	28	8.7
Occupation			
	Unemployed	24	7.5
	Farmer	49	15.2
	informal job	115	35.7
	Employed	56	17.4
	Business	78	24.2
Religion			
	No religion	3	0.9
	Catholic	114	35.4
	ADEPR	79	24.5
	Adventist	84	26.1
	Muslim	41	12.7
	Others	1	0.3
Ubudehe Category			
	First CAT	1	0.3
	Second CAT	157	48.8
	Third CAT	163	50.6
	Fourth CAT	1	0.3
Place of residence			
	Rural	247	76.7
	Urban	75	23.3

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4.2. Presentation of findings

4.2.1 Determine knowledge level about oral hygiene among adult patients attending dental service in Muhima DH

Table 4.2 shows the percentage distribution of participants on knowledge towards oral hygiene. Overall, 96% of participants have reported that smoking does not affect to the gum's health. The majority of respondents presenting 72% stated that gum bleeding is indicative of a mouth issue or infection. Overall, 56.2% of the participants knew that tooth decay is a result of poor oral hygiene and 40.4% stated a medium to soft toothbrush is appropriate for brushing while 59.6% said it is not. In this study, only 35.1% of the participants knew that twice-a day routine tooth brushing contribute to the cleanliness and well-being of teeth and 64.9% said not. Furthermore, 45.3% of the respondents were aware that failing to brush your teeth can lead to the formation of plaque and dental decay. In this study about two-third (63.4%) of the participants replied that brushing teeth once per day is enough for everyone and 36.6% said not enough as shown in Table 4.2.1.

Table 4. 2: Frequency distribution of knowledge on oral hygiene of adult patients attending dental service in Muhima District Hospital, Rwanda

Variables		Frequency	Percent
Does smoking has an effect to your gums			
	Yes	13	4.0
	No	309	96.0
Is gum bleeding indicative of a mouth issue or infection			
	Yes	232	72.0
	No	90	28.0
Is tooth decay a result of poor oral hygiene			
	Yes	181	56.2
	No	141	43.8
Is a medium to soft toothbrush appropriate for brushing			
	Yes	130	40.4
	No	192	59.6
twice-a day routine tooth brushing contributes to the cleanliness and well-being of teeth?			
	Yes	113	35.1
	No	209	64.9
Are you aware that failing to brush your teeth can lead to the formation of plaque and dental decay?			
	Yes	146	45.3
	No	176	54.7
Brushing teeth once per day is not enough for everyone			
	Yes	204	63.4
	No	118	36.6

4.2.2. Level of knowledge on oral hygiene among adult patients attending dental service in Muhima District Hospital, Rwanda

The overall score of results of knowledge level of oral hygiene indicated that 61.5% of respondents had good knowledge towards a oral hygiene among adult patients attending dental service in Muhima District Hospital, Rwanda, and the remaining 38.5% of them had poor knowledge as indicated in Figure 4.2.

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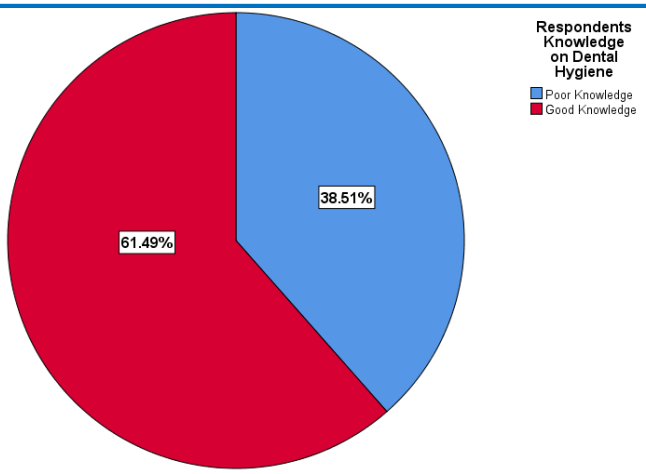

Figure 4. 2: Overall score of knowledge towards oral hygiene

4.2.3 Attitudes towards oral hygiene among adult patients attending dental service in Muhima District Hospital, Rwanda

The second objective was to determine the attitude towards oral hygiene adult patients attending dental service in Muhima District Hospital, Rwanda

Table 4.3 presents the results on the attitude towards oral hygiene adult patients attending dental service in Muhima District Hospital, Rwanda.
The overall means score of different attitudes question was found below the average (2.6), implying all adult patients attending Muhima District Hospital have a negative attitude towards oral hygiene. Out of the 322 respondents, 85 adult (26.4%) were unsure whether or not oral disease are as dangerous as other diseases. Only 26 (8.1%) and 71(22.0) adult patients were strongly disagreeing and disagree with the statement "oral disease are not dangerous as other diseases", respectively. While, 41 (12.7%) and 99(30.7%) adults were strongly agreeing and agree with the statement "oral disease are not dangerous as other diseases", respectively. In the present study, 238(73.9%) and 81(25.2%) of study participants strongly disagree and disagree with a statement "teeth brushing is for rich people. Similarly, 124(38.5%) and 186(57.8%) had the same opinion on small piece of trees and charcoal, salts, and ware are better than tooth brushing. Regarding to cultural factors, surprisingly, 78(24.2%), 145(45.0%), and 50(15.5%) of adult patients attending at Muhima District Hospital were unsure, agree, and strongly agree on a statement "in our culture we don't need to visit the dentist", respectively. More than eight-tenth (80.7%) disagree that toothbrush and toothpaste are expensive while 34(10.6%) and 20(6.2%) were unsure and agree with it. Thirty-one percent (31.7%) of adults' patients agree that they should brush their teeth twice a day. In this study, about 154(47.8%) of the participants disagree with the statement "I can clean my teeth without toothpastes". In this study, 195(60.6%) agree and 89(27.7%) strongly agree with a statement that that decayed teeth affects appearances. Results are highlighted in Table 4.3.

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Table 4. 3: Attitude towards oral hygiene of adult patients attending dental service in Muhima District Hospital, Rwanda

Variables	Strongly disagree	Disagree	Unsure	Agree	Strongly agree	Mean	SD
Oral diseases are not dangerous as other diseases	26(8.1)	71(22.0)	85(26.4)	99(30.7)	41(12.7)	3.18	1.15
Teeth brushing is for rich people	238(73.9)	81(25.2)	1(0.3)	1(0.3)	1(0.3)	1.28	0.51
In our culture we don't need to visit the dentist.	23(7.1)	26(8.1)	78(24.2)	145(45.0)	50(15.5)	3.54	1.07
Small pieces of trees and charcoal, salts and only water are better than toothbrush	124(38.5)	186(57.8)	10(3.1)	1(0.3)	1(0.3)	1.66	0.59
Toothbrush and toothpastes are expensive	7(2.2)	260(80.7)	34(10.6)	20(6.2)	1(0.3)	2.22	0.6
I should brush my teeth twice a day	6(1.9)	71(22.0)	104(32.3)	102(31.7)	39(12.1)	3.3	1
I can clean my teeth without toothpastes	69(21.4)	154(47.8)	38(11.8)	37(11.5)	24(7.5)	2.36	1.16
Brushing teeth after eating negatively impact sleep and digestion	120(37.3)	152(47.2)	48(14.9)	1(0.3)	1(0.3)	1.79	0.72
Decayed teeth affect appearance	1(0.3)	12(3.7)	25(7.8)	195(60.6)	89(27.7)	4.11	0.72

4.2.4. Attitude of adult patients towards oral hygiene

The overall score of attitudes towards oral hygiene indicated that a 62.4% of respondents had a positive attitude towards oral hygiene, and the remaining 37.6% had a negative attitude towards oral hygiene. Findings is presented in figure 4.3.

Eight questions make up the attitude section of the questionnaire, which is centered on attitudes toward maintaining dental health. Initially, the statements related to the attitude were divided

into five categories of responses: strongly disagree, disagree, agree, and no opinion. The measure of agreement was obtained by combining the categories of strongly agree and agree. On the other hand, the measure of disagreement was obtained by combining the categories of disagree, strongly disagree, and no opinion. The total score of attitudes for each participant was then determined by taking into account a positive attitude (score 1) and a negative attitude (score 0) for each statement

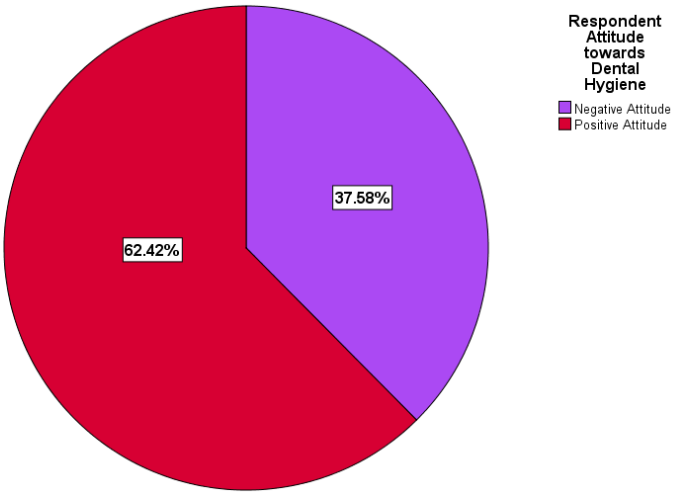

Figure 4. 3: Overall score of attitudes towards oral hygiene

4.3. Establish the practice of oral hygiene among adult patients attending dental service

The third objective was the practice of oral hygiene practice among adult patients attending dental service in Muhima District Hospital, Rwanda. The descriptive analysis is shown in Table 4.4.

4.3.1 Percentage distribution of oral hygiene practice and independent variables among adult patients attending dental service in Muhima District Hospital, Rwanda

Table 4.4 shows the results on the practice towards oral hygiene practice among adult patients attending dental service in Muhima District Hospital, Rwanda. Out of 322 respondents, 109 (33.9%) of patients brush their teeth at least twice a day. Moreover, out of 322 respondents, 63 (19.6%) brush their teeth for a 2-minutes. About 40% of the participants brush their tongue during teeth brushing, while the remaining 60.9% do not. In this study, 295(91.6%) rinse their mouth after eating. More than four-tenth (42.9%) of the participants use clean water for brushing their teeth. Almost all (94.4%) of the participants use fluoride toothpaste for brushing their teeth. However, a similar proportion (90.1%) of the respondents does use toothbrush for more than three-months. In this study, none of the participants visit a dentist on yearly basis and use floss for their teeth as indicated in Table 4.4.

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Table 4.4: Frequency distribution of oral hygiene practices of adult patients attending dental service in Muhima District Hospital, Rwanda

Variables		Frequency	Percent
I brush my teeth at least twice per day			
	Yes	109	33.9
	No	213	66.1
I brush my teeth at least for 2 minutes			
	Yes	63	19.6
	No	259	80.4
I brush my tongue as well.			
	Yes	126	39.1
	No	196	60.9
I rinse my mouth after eating.			
	Yes	295	91.6
	No	27	8.4
I use clean water for brushing my teeth			
	Yes	138	42.9
	No	184	57.1
I use fluoride toothpaste			
	Yes	304	94.4
	No	18	5.6
My toothbrush doesn't exceed three months			
	Yes	32	9.9
	No	290	90.1
I yearly visit a dentist			
	No	322	100
I floss my teeth			
	No	322	100

4.3.2 Practice of oral hygiene among adult patients attending dental service in Muhima District Hospital, Rwanda

The overall score of results of practice on oral hygiene among adult patients attending dental service in Muhima District Hospital, Rwanda indicated that a high percentage (77%) of the respondents were practicing a good oral hygiene, and the remaining less than one-fourth (23%) were not practicing a good oral hygiene. Findings were presented in figure 4.4.

The patient's oral hygiene practices were observed using a tool known as the dental model, which was appropriated and borrowed from the World Health Organization. A participant was deemed to have good practice if they finished all necessary steps; those who just failed one step were deemed to have poor practice.

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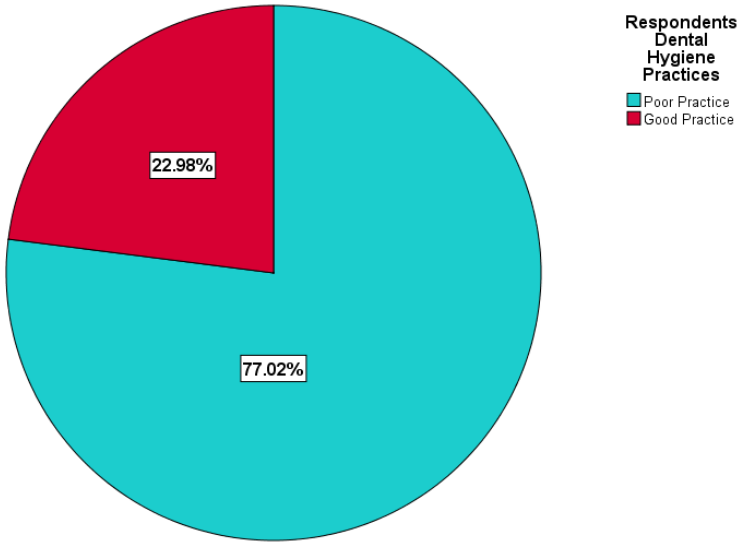

Figure 4.4: Overall score of practice towards oral hygiene

4.4 Factors associated with oral hygiene practices among adult patients attending dental service in Muhima District Hospital, Rwanda

The factors asociated with oral hygiene practice among adult patients attending dental service in Muhima District Hospital, Rwanda are prenented in Table 4.5.

4.4.1. Analysis of sociodemographic variables associated with oral hygiene practice among adult patients attending Muhima District Hospital, Rwanda

Table 4.5 displays an analysis of sociodemographic variables associated with oral hygiene practices among adult patients attending Muhima District Hospital in Rwanda. The variables examined include age, sex, marital status, education level, occupation, religion, Ubudehe Category, and place of residence, all compared against the oral hygiene practices categorized as poor or good. Age of respondents there doesn't seem to be a significant association between age and oral hygiene practices. The X^2 value (a measure of association in the Chi-square test) is 2.958 with a p-value of 0.398, indicating no significant relationship between age groups and oral hygiene practices. Similarly, there was no significant association between gender and oral hygiene practices where X^2 value is 1.137 with a p-value of 0.286, suggesting no strong relationship between being male or female and oral hygiene practices. Similarly, no association between marital status and oral hygiene practices was identified into the present study.

The analysis indicates that there was no strong association between education level and oral hygiene practices where p-value is 0.155, indicating no significant relationship. Similarly, the data didn't show a significant association between occupation and oral hygiene practices for p-value is 0.517, signifying no strong correlation. There was no strong association between religion and oral hygiene practices, as the p-values for different religions are above the common threshold of significance (p-value for each religion group is above 0.05). And there was no significant association between the Ubudehe category and oral hygiene practices. The X^2 value is 0.607 with a p-value of 0.895, indicating no g relationship.

There was a significant association between the place of residence and oral hygiene practices where X^2 value is 7.543 with a p-value of 0.006. This suggests a statistically significant relationship, showing that rural residents tend to have poorer oral hygiene practices compared to urban residents.

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These data show that the place of residence (rural and urban) has a notable association on oral hygiene practices among adult patients attending Muhima District Hospital in Rwanda, while the other sociodemographic variables analyzed do not show significant associations with oral hygiene practices among the study's participants**.**

Table 4. 5: Analysis of sociodemographic variables associated with oral hygiene practice among adult patients attending Muhima District Hospital, Rwanda

Variables		Total	Oral hygiene Practice		Chi square	P-value
			Poor Practice	Good Practice		
Age of respondents	35-45 Years	114(35.4)	94(37.9)	20(27.0)	2.958	0.398
	46-55 Years	99(30.7)	73(29.4)	26(35.1)		
	56-65 Years	78(24.2)	58(23.4)	20(27.0)		
	66-55 Years	31(9.6)	23(9.3)	8(10.8)		
Sex of respondent	Male	148(46.0)	118(47.6)	30(40.5)	1.137	0.286
	Female	174(54.0)	130(52.4)	44(59.5)		
Marital status	Single	7(2.2)	6(2.4)	1(1.4)	4.542	0.209
	Widow	13(4.0)	13(5.2)	0(0.0)		
	Divorced	26(8.1)	19(7.7)	7(9.5)		
Education level	Illiterate	11(3.4)	11(4.4)	0(0.0)	5.246	0.155
	Primary	147(45.7)	107(43.1)	40(54.1)		
	Secondary	136(42.2)	108(43.5)	28(37.8)		
	University	28(8.7)	22(8.9)	6(8.1)		
Occupation	Unemployed	24(7.5)	20(8.1)	4(5.4)	3.25	0.517
	Farmer	49(15.2)	36(14.5)	13(17.6)		
	informal job	115(35.7)	92(37.1)	23(31.1)		
	Employed	56(17.4)	39(15.7)	17(23.0)		
	Business	78(24.2)	61(24.6)	17(23.0)		
Religion	No religion	3(0.9)	3(1.2)	0(0.0)	7.503	0.186
	Catholic	114(35.4)	94(37.9)	20(27.0)		
	ADEPR	79(24.5)	59(23.8)	20(27.0)		
	Adventist	84(26.1)	63(25.4)	21(28.4)		
	Muslim	41(12.7)	29(11.7)	12(16.2)		
Ubudehe Category	Second CAT	158(49.1)	122(49.2)	36(48.6)	0.607	0.895
	Third CAT	164(50.9)	126(50.8)	38(51.4)		
Place of residence	Rural	247(76.7)	199(80.2)	48(64.9)	7.543	**0.006**
	Urban	75(23.3)	49(19.8)	26(35.1)		

Source: Primary data, (2023)

4.4.2 Analysis of association between knowledge and oral hygiene practice among adult patients attending Muhima District Hospital, Rwanda

Tabel 4.6 shows that the analysis of various factors associated with oral hygiene practices among adult patients attending Muhima District Hospital in Rwanda. The table presents different variables related to dental practices, such as smoking, perceptions about oral health, tooth brushing habits, knowledge levels, and attitudes are prenented in Table 4.6. The data

suggests that smoking doesn't show a significant association with good or poor oral hygiene practices (P-value: 0.993). Both categories of practice (poor and good) seem similar among smokers and non-smokers. There was a trend indicating that individuals who perceive gum bleeding as indicative of a mouth issue or infection tend to have better oral hygiene practices, although the association wasn't statistically significant (P-value: 0.093). The belief that tooth decay results from poor oral hygiene doesn't significantly associate with the oral hygiene practices of the respondents (P-value: 0.670). The type of toothbrush (medium to soft) used doesn't significantly associate with the oral hygiene practices (P-value: 0.813). There was a significant association between the belief in the benefits of a twice-daily tooth brushing routine and good oral hygiene practices (P-value: 0.026).

The awareness that not brushing teeth leads to plaque and decay doesn't significantly influence dental practices (P-value: 0.700). There is a significant association between the belief that brushing teeth once a day isn't enough and good dental practices (P-value: 0.012). Both good knowledge and positive attitudes were significantly associated with good oral hygiene practices (P-values: 0.010 and 0.112, respectively).

Some factors like the frequency of brushing, knowledge levels, and attitudes showed a significant association with good oral hygiene practices among the patients attending the hospital. Other factors, such as perceptions regarding tooth decay, appropriate toothbrush type, and awareness of the effects of not brushing, do not seem to significantly impact dental practices. Overall, the data suggests that certain beliefs, knowledge, and habits specifically, those related to brushing frequency, knowledge, and attitude have a stronger correlation with good oral hygiene practices among the adult patients in this study.

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Table 4.6: Analysis of association between knowledge and oral hygiene practice among adult patients attending Muhima District Hospital, Rwanda.

Variables		Total	Oral hygiene Practice		chi square	P-value
			Poor Practice	Good Practice		
Does smoking has an effect to your gums?	Yes	13(4.0)	10(4.0)	3(4.1)	0	0.993
	No	309(96.0)	238(96.0)	71(95.9)		
Is gum bleeding indicative of a mouth issue or infection?	Yes	232(72.0)	173(69.8)	59(79.7)	2.814	0.093
	No	90(28.0)	75(30.2)	15(20.3)		
Is tooth decay a result of poor oral hygiene?	Yes	181(56.2)	141(56.9)	40(54.1)	0.182	0.67
	No	141(43.8)	107(43.1)	34(45.9)		
Is a medium to soft toothbrush appropriate for brushing?	Yes	130(40.4)	101(40.7)	29(39.2)	0.056	0.813
	No	192(59.6)	147(59.3)	45(60.8)		
Twice-daily tooth brushing routine contribute to the cleanliness and well-being of teeth??	Yes	113(35.1)	79(31.9)	34(45.9)	4.968	**0.026**
	No	209(64.9)	169(68.1)	40(54.1)		
Are you aware that failing to brush your teeth can lead to the formation of plaque and dental decay?	Yes	146(45.3)	111(44.8)	35(47.3)	0.148	0.7
	No	176(54.7)	137(55.2)	39(52.7)		
Brushing teeth once per day is not enough for everyone?	Yes	204(63.4)	148(59.7)	56(75.7)	6.283	**0.012**
	No	118(36.6)	100(40.3)	18(24.3)		
Knowledge about oral hygiene practice	Good Knowledge	124(38.5)	86(34.7)	38(51.4)	6.692	**0.01**
	Poor Knowledge	198(61.5)	162(65.3)	36(48.6)		
Attitude towards oral hygiene practice	Negative Attitude	121(37.6)	99(39.9)	22(29.7)	2.523	0.112
	Positive Attitude	201(62.4)	149(60.1)	52(70.3)		

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4.4.3 Multivariate analysis of predicting variables of oral hygiene practices among adult patients attending Muhima District Hospital, Rwanda

The as indicated in table 4.7, results of a logistic regression analysis conducted to predict oral hygiene practices among adult patients attending Muhima District Hospital in Rwanda. The analysis involves both univariate (considering one variable at a time) and multivariate (considering multiple variables simultaneously) models.

In regard to place of residence, the odds of having certain oral hygiene practices were significantly higher in urban areas (2.20 times more) compared to rural areas with 95% C.I. [0.76-2.46].

Furthermore, twice-daily tooth brushing routine the Patients who follow a twice-daily tooth brushing routine are 1.82 times more likely to have good oral hygiene practices, and in the adjusted model (AOR), this likelihood increases to 2.25 within 95% C.I. [1.25-4.05]. Those who believe that brushing teeth once per day is not enough were 2.10 times more likely to have good oral hygiene practices, with an adjusted odds ratio of 1.85 within 95% C.I. [1.04-3.28]. The Individuals with good knowledge have nearly 2 times higher odds of following good oral hygiene practices, increasing to 2.08 in the adjusted model 95% C.I. [1.09-3.99]. Overall, these results indicate that maintaining a twice-daily brushing routine and having good knowledge about oral hygiene are key factors associated with better oral hygiene practices among adult patients in the study population. However, beliefs about brushing frequency and place of residence may also play a role, but their significance is less pronounced when accounting for other factors in the analysis.

Table 4. 7: Multivariate analysis of predicting variables of oral hygiene practices among adult patients attending Muhima District Hospital, Rwanda

Variables		95% C.I.				95% C.I.			
		COR	Lower	Upper	P-value	AOR	Lower	Upper	P-value
Place of residence	Rural	**Ref[1.00]**				**Ref[1.00]**			
	Urban	2.2	1.24	3.89	**0.007**	1.36	0.76	2.46	0.303
twice-daily tooth brushing routine contribute to the cleanliness and well-being of teeth	No	**Ref[1.00]**				**Ref[1.00]**			
	Yes	1.82	1.07	3.09	**0.027**	2.25	1.25	4.05	**0.007**
Brushing teeth once per day is not enough for everyone	No	**Ref[1.00]**				**Ref[1.00]**			
	Yes	2.1	1.17	3.79	**0.013**	1.85	1.04	3.28	**0.036**
Knowledge about oral hygiene practice	Poor knowledge	**Ref[1.00]**				**Ref[1.00]**			
	Good Knowledge	1.99	1.18	3.36	**0.01**	2.08	1.09	3.99	**0.027**

4.5. Discussion

The study conducted at Muhima District Hospital in Rwanda aimed to assess knowledge, attitudes, and practices related to oral hygiene among adult patients attending the dental service. The findings revealed that 61.5% of respondents demonstrated good knowledge regarding oral hygiene. While participants exhibited understanding in areas such as the impact of smoking on gum health, the significance of gum bleeding as a sign of oral issues, and the importance of twice-daily tooth brushing, misconceptions persisted regarding tooth brushing frequency and certain oral hygiene practices. This aligns with studies conducted in India and Nigeria, indicating a widespread lack of oral hygiene awareness and limited knowledge of oral health practices among patients (Al-Zarea, 2013; Akinyamoju et al., 2018).

Positive attitudes toward oral hygiene were observed in 62.4% of respondents, which contrasts with findings from a study in Ethiopia where a significant portion of the population exhibited poor attitudes toward dental care services (Selvaraj et al., 2021). The majority of participants in the Rwandan study were married and employed, contributing to their favorable attitudes. Employment status and marital relationships were shown to be associated with positive dental health-related attitudes and behaviors, emphasizing the influence of social networks and family support (Wong, 2020).

However, despite the positive attitudes, the study unveiled that 77% of respondents had poor oral hygiene practices. Factors such as urban residence and specific beliefs, like the importance of brushing teeth twice daily, were associated with better oral hygiene practices. This contrasts with findings from studies in Nigeria and Mumbai, where a considerable proportion of participants exhibited poor oral hygiene practices (Umanah & Braimoh, 2017; Al-Zarea, 2013). The study suggests that participants' limited knowledge may contribute to their suboptimal oral hygiene practices, echoing the notion that improved education and awareness campaigns are crucial.

The study recognizes certain limitations, such as the lack of generalizability due to its single-hospital setting and potential recall bias among respondents with medical conditions. Nonetheless, the findings underscore the importance of targeted educational campaigns to enhance awareness of consistent tooth brushing and the interconnection between dental problems and oral hygiene. Additionally, addressing negative attitudes toward oral hygiene is vital for overall improvement in oral health practices. Dental professionals are encouraged to consider these aspects in health promotion initiatives, emphasizing the significance of both knowledge and attitudes in fostering better oral hygiene practices among the population.

5. Conclusions and recommendations

In conclusion, the study at Muhima District Hospital revealed substantial deficiencies in knowledge, attitudes, and practices related to oral hygiene among adult patients. The lack of awareness about essential aspects of oral health and the prevalence of negative attitudes highlight the urgency for targeted interventions. To address these issues, recommendations are proposed. The Ministry of Health should conduct community health education and radio health talk shows to enhance awareness and basic knowledge of oral hygiene. The government should allocate resources to increase the accessibility of oral and dental care services in nearby hospitals and health centers. Hospital administrations should sensitize the public about the rising prevalence of periodontal diseases and emphasize the importance of routine dental checkups. Non-Governmental Organizations (NGOs) are encouraged to conduct health education programs and outreach activities to underscore the significance of oral hygiene. By

implementing these recommendations, there is a potential to bridge the knowledge gap, reshape negative attitudes, and foster healthier oral hygiene practices among adult patients at Muhima District Hospital, ultimately improving overall dental health and well-being.

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