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Prevalence and Factors Associated with Dental Caries among Patients Attending Gahini District Hospital, Rwanda

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Abstract: **This study investigates the prevalence and associated factors of dental caries among adults attending Gahini District Hospital in Rwanda, where dental caries remains a major public health concern. Using a cross-sectional quantitative design, data were collected from 415 adults aged 18 and above between February and March 2025 through systematic random sampling and structured questionnaires. Analysis was conducted using SPSS, employing both descriptive and inferential statistical methods, including logistic regression.**

The results showed that 72.8% of participants had dental caries. Age was a significant factor: individuals aged 30–50 and over 50 were more likely to have caries than those under 30. Gender differences were also observed, with females showing a higher likelihood of dental caries. Poor oral hygiene practices—such as brushing once or less per day—and not using oral hygiene products like mouthwash significantly increased caries risk. Additionally, frequent consumption of sugary foods and drinks, particularly daily or several times a week, was associated with higher prevalence. Chronic conditions, especially diabetes, were also linked to increased risk.

The findings underscore the urgent need for targeted oral health interventions focusing on hygiene practices, dietary behavior, and chronic disease management in the Gahini region.

Keywords: **Prevalence, Dental Caries, Patients Gahini District Hospital, Rwanda.**

I. INTRODUCTION

The global prevalence of dental caries varies across regions due to differences in dietary habits, socio-economic status, public health policies and access to dental care. In high-income countries, there has been a decline in dental caries incidence due to improved oral hygiene practices, fluoridation of drinking water, and widespread use of dental care services (Petersen & Ogawa, 2019). However, in developing countries, including many in Africa, the prevalence continues to be high, often due to limited access to preventive care, inadequate oral health education, and dietary changes that include increased sugar consumption (Kassebaum et al., 2017).

In Africa, dental caries is a significant public health problem, though the prevalence varies widely across the continent. The situation is exacerbated by a lack of access to the services of dental care, lack of oral health professionals, and insufficient public health initiatives aimed at preventing oral diseases. A systematic review conducted in 2019 revealed that the prevalence of dental caries in African children ranges from 30% to 90%, depending on the country and age group (Ayele et al., 2019). The burden of tooth decays in Africa is also influenced by socio-economic factors, with higher prevalence rates often observed in urban regions. This tendency is linked to urbanization, which brings changes in dietary patterns, particularly an increase in the consumption of refined sugars and processed foods.

Furthermore, the use of fluoride toothpaste is not as widespread in many African countries, and public awareness about the weight of oral hygiene remains low (Agbor & Naidoo, 2016). In East Africa, the prevalence of tooth decays mirrors the trends observed across the continent, with significant variability between countries. For instance, studies have reported a prevalence rate of about 35% in Kenya, 45% in Uganda, and over 50% in Tanzania among children aged 6 to 12 years (Mutua & Ngugi, 2021). The high prevalence rates are often attributed to limited access to dental health services, poor oral hygiene practices and a lack of fluoride in drinking water (Mbawalla et al., 2020).

In Rwanda, the increasing prevalence of dental caries is becoming a significant public health issue, especially in rural regions where dental care infrastructure is scarce. Limited access to preventive and curative dental services exacerbates the problem, leading to higher rates of untreated dental caries (Kabera & Nkubito, 2019). A research conducted in 2020 in the Northern region of Rwanda reported a dental caries prevalence of 52.5% among schoolchildren aged 7 to 12 years (Umubyeyi et al., 2020). The study highlighted the need for improved oral health education, better access to preventive care to reduce the burden of dental caries in the region (Ntawukuliryayo & Uwitonze, 2021).

Rwanda, like many other East African countries, is grappling with the challenge of high dental caries prevalence. The country's oral health burden is compounded by factors such as limited access to services related to dental care, especially in rural areas, and a lack of public awareness about oral hygiene practices. A study done in Kigali in 2018 showed that the prevalence of tooth decays in adult population was 47.8% (Uwitonze et al., 2018). The study also identified several factors associated with the high prevalence, including poor oral hygiene, infrequent dental visits, and high sugar consumption (Kabera & Nkubito, 2019).

In Gahini District Hospital, where this study is focused, the situation is reflective of the broader national trends. The hospital, which serves a predominantly rural population, has reported an increasing number of dental caries cases over the years (Gahini District Hospital, 2023). Factors such as limited access to fluoride toothpaste, inadequate oral health education, and cultural practices related to diet and oral hygiene are believed to contribute to the high prevalence of tooth decays in this part of the country. That is why this study is important as it assessed the prevalence of dental caries among patients attending Gahini district Hospital, Dental clinic and the related factors. The main objective of this study was to assess the Prevalence and the factors associated with dental caries among patients attending Gahini District Hospital, Dental clinic. It was guided by the following specific objectives:

i. To measure the prevalence of dental caries among patients attending Gahini District Hospital, Dental clinic.

ii. To assess the factors associated with dental caries among patients attending Gahini District Hospital, Dental clinic.

II. THEORETICAL FRAMEWORK

Theory of Planned Behavior (TPB)

The TPB, framed by Icek Ajzen, refers to framework explaining how individuals make decisions to engage in specific behaviors. Central to the TPB is the idea that the intention of an individual to perform a particular behavior is the most significant predictor of whether or not they will actually do so. Those intentions are subjective to 3 mechanisms: perceived behavioral control, subjective norms and attitudes toward the behavior. Attitude is defined as the negative or positive evaluation of an individual of performing the behavior, essentially reflecting whether they see it as beneficial or harmful. Subjective norms involve the social pressures or expectations perceived by the individual from others, which can either encourage or discourage the behavior.

Perceived behavioral control, the third component, is defined as the perception of individuals of their own aptitude to execute the behavior, which includes their confidence in overcoming potential obstacles (Bosnjak et al., 2020). According to the TPB the three factors, perceived behavioral control, subjective norms and attitudes interact to profile the behavioral intentions of an individual. The strength of these components can vary, meaning that one factor might have a more significant influence on intention than the others, depending on the behavior in question. Ultimately, the TPB offers a broad model for understanding how and why individuals choose to act in certain ways, offering valuable insights for predicting and influencing behavior in various contexts, such as health promotion, environmental conservation, and organizational management (Bosnjak et al., 2020). TPB provides a framework for understanding how these factors can influence health behaviors, including preventive actions related to dental health.

Health Belief Model (HBM)

The HBM was initially framed by Irwin Rosenstock assisted by Godfrey Hochbaum and others at the U.S. PHS. The Health Belief Model (HBM) emphasizes individual beliefs about health conditions and the perceived advantages and obstacles related to preventive actions. It incorporates several key constructs, including Perceived Benefits, which pertains to the perceived advantages of taking preventive measures and Perceived Barriers, which are the obstacles that may hinder individuals from taking action (Rosenstock, 2018).According to the HBM, individuals are more likely to adopt health-promoting behaviors, such as being diagnosed or treated for oral health diseases, if they believe they are at a high risk for the condition and recognize its potential severity.

Additionally, if they perceive that taking preventive measures will effectively reduce their risk and if they encounter minimal barriers to these actions, they are more inclined to engage in such behaviors. Together, these factors help explain why some people take preventive health measures, such as getting vaccinated or adopting healthy lifestyle habits, while others do not. The HBM is widely used in designing health interventions and educational programs to promote behavior change (Alyafei et al., 2024). This model is instrumental in understanding health behavior changes and can help explain why individuals may or may not engage in preventive dental practices (Alyafeiet al., 2024).

Application to the Study

In the situation of the research on dental caries among patients at Gahini District Hospital, TPB can be applied to examine how patients' attitudes towards oral hygiene, perceived social pressures, and their perceived control over dental health behaviors influence their actions related to caries prevention. For instance, understanding how patients view the importance of dental check-ups and their perceived ability to access and afford dental care can provide insights into their preventive practices.

Meanwhile, the Health Belief Model can help explain patients' perceptions of the risks associated with dental caries, the benefits of preventive care, and the barriers they face (Alyafei et al., 2024). By applying these theories, the study can better identify factors influencing caries prevalence and prevention behaviors specific to the region of Gahini context, ultimately informing targeted interventions and improving oral health outcomes.

III. CONCEPTUAL FRAMEWORK

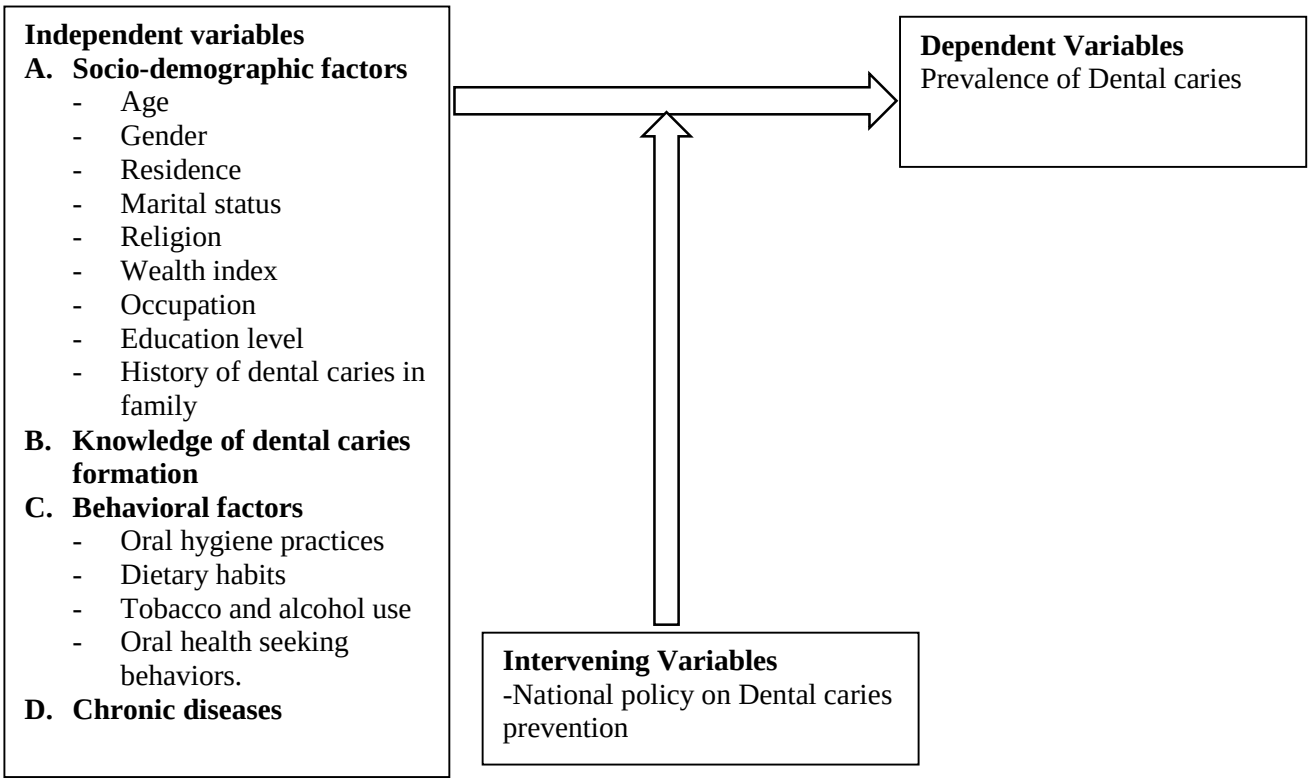

Figure 1: The Conceptual Framework

Based on the information summarized in this conceptual framework, the independent variables are those variables related to socio-demographic characteristics (Age, Gender, Residence, Marital status, Religion, Wealth index, Occupation, Education level and History of dental caries in family), Knowledge of dental caries formation, Behavioral factors (Dietary habits, Oral hygiene practices, alcohol and Tobacco use and Oral health seeking behaviors) and Chronic diseases. These variables have an impact on dependent variable which is dental caries. The intervening variable for this study is the national policy on dental caries prevention.

IV. RESEARCH METHODOLOGY

Study Design

It was conducted at Gahini District Hospital, specifically within its Dental Clinic. Gahini District Hospital is situated in the Eastern Province of Rwanda, within Kayonza District, and specifically in the Gahini sector. This hospital serves a broad catchment area, providing healthcare services to a diverse population from both urban and rural areas within the district and its surroundings (Gahini District Hospital, 2023). Gahini District Hospital is a prominent healthcare facility in the region, offering a range of services including dentistry. The Dental Clinic at this hospital plays a crucial role in addressing oral health needs, including preventive care, diagnosis, and treatment of dental conditions such as dental caries (Gahini District Hospital, 2023).

The Eastern Province of Rwanda, where the hospital is located, is characterized by a largely rural population with varying levels of access to healthcare services. The region has unique socioeconomic and cultural factors that may influence oral health behaviors and the prevalence of dental conditions. The Gahini sector, being part of this diverse region, provides a relevant context for studying dental caries, as it encompasses a range of community health challenges and access issues that are typical of rural settings in Rwanda (Gahini District Hospital, 2023). Conducting the study at this location allows obtaining information on dental caries prevalence and associated factors within a specific regional and healthcare context. It provides an opportunity to gather data from patients who utilize the dental services at Gahini District Hospital, contributing to improving oral health in this region.

Target Population

This study targeted adult patients (out-patients) who attended Gahini District Hospital in the period of study interest from February 2025 to March 2025. Gahini Hospital dental clinic receive averagely 600 patients a month who come for oral health (Gahini District Hospital, 2024).

Inclusion Criteria

i. Patients aged 18 years old and above who sought the dental care at Gahini District Hospital at the selected period of the study.

ii. Willingness to participate in this study.

Exclusion Criteria

Exclusion criteria were based on:

i. Patients aged less than 18 years old.

ii. Unwillingness to participate in the study.

iii. Unable to speak and respond the study questionnaire.

Sample Size and Sampling Technique

Sample Size

To obtain the adequate sample size, a single population proportion Cochrane formula with 56.9% of prevalence(Singh & Masuku, 2014; Creswell, 2018).

Sample size (n) = Z^2Pq/e^2

With:

n = is sample size.

z = 1.96 is the SD of 95% CI.

p = Estimated prevalence.

E = marginal of error or absolute error or precision (in this case 5% or 0.05). The mean Prevalence of dental caries was found to be at 56.9% between42.42% to 71.5% (Kanmodi et al., 2023).

P= Prevalence of outcome of interest (56.9%) =0.569

$$n = \frac{(1.96)^2 \cdot 0.569(1 - 0.569)}{(0.05)^2} = 376.8 \sim 377$$

By considering to possible non-response rate of 10%,

n_0= 376×10/100= 37.6≈38

The final sample size was: 377+38= 415

Sampling Technique

The sampling method employed was systematic random sampling (Tabachnick & Fidell, 2019). Initially, a sampling frame was created comprising all the patients attending Gahini District Hospital, dental clinic during the period of the study. Their list was created according to the daily attendance. Subsequently, a random starting point was selected from the sampling frame using an equal chance selection method. The sampling interval for this study was calculated as 600 of monthly attendance divided by 415, resulting in 1.4, rounded to 2. Therefore, the sampling interval falls between 1 and 2. Conducting simple random sampling within this interval revealed that 2 was identified as the kth unit. Consequently, selection occurred at every 2 units until the desired sample size is attained in daily basis (Raina, 2015).

Methods of Data Collection

Instruments of Data Collection

Only a questionnaire was utilized in this study. It has been designed to gather comprehensive information on several key areas relevant to the research objectives. It is divided into various sections that focus on both independent and dependent variables. The independent variables served as predictors in the study and focused on sociodemographic characteristics. In addition, the questionnaire covered the participants' Knowledge of Dental Caries Formation, exploring their awareness and understanding of how dental caries develop.

Furthermore, Behavioral Factors were assessed, including Dietary Habits, Oral Hygiene Practices, Alcohol and Tobacco Use, and Oral Health Seeking Behaviors. These factors are crucial for understanding the role of lifestyle in dental caries occurrence. Lastly, the questionnaire also collected information on the presence of Chronic Diseases, as these can influence both oral health and overall health outcomes. All these questions are related to objective 1 of the study. Objective 2 is covered by the last section which seek the information related to the participants having been diagnosed with dental caries by a healthcare professional.

V. RESEARCH FINDINGS AND DISCUSSION

Socio-Demographic Characteristics of Study Participants Among Patients Attending Gahini District Hospital, Dental Clinic

Details concerning the socio-demographic characteristics of study participants among patients attending Gahini district Hospital, Dental clinic are displayed in the Table 1 below:

Table 1: Socio Demographic Characteristics of the Study Participants among Patients Attending Gahini District Hospital, Dental Clinic

Variables	Frequency	Percentage
Age		
Less than 30	92	22.2
30-50	192	46.3
Over 50	131	31.6
Gender		
Male	164	39.5
Female	251	60.5

Residence		
Urban	71	17.1
Rural	344	82.9
Marital status		
Married	272	65.5
Single	90	21.7
Divorced	4	1.0
Widowed	49	11.8
Religion		
Catholic	122	29.4
Protestant	173	41.7
Islam	32	7.7
None	2	.5
Other	86	20.7
Wealth index		
1st cat	30	7.2
2nd cat	184	44.3
3rd cat	201	48.4
Occupation		
Unemployed	116	28.0
Student	6	1.4
Self-employed	252	60.7
Employed (Public sector)	19	4.6
Employed (Private sector)	22	5.3
Education		
No formal education	37	8.9
Primary education	166	40.0
Secondary education	173	41.7
Higher education	39	9.4
History of dental carries		
Yes	116	28.0
No	146	35.2
Don't know	153	36.8

Source: Researcher, 2025

The characteristics of the study participants revealed that the greater part were aged between 30 and 50 years (46.3%), followed by those over 50 years (31.6%), and those less than 30 years (22.2%). Females comprised 60.5% of the participants, while males accounted for 39.5%. Most respondents resided in rural areas (82.9%) compared to 17.1% from urban settings. Regarding marital status, 65.5% were married, 21.7% were single, 11.8% were widowed, and 1.0% were divorced. The dominant religious affiliations were Protestant (41.7%) and Catholic (29.4%), followed by other religions (20.7%), Islam (7.7%), and none (0.5%). In terms of wealth index, 48.4% of participants were in the third category, 44.3% in the second category, and 7.2% in the first category. Concerning occupation, the majority were self-employed (60.7%), while 28.0% were unemployed, 5.3% worked in the private sector, 4.6% were employed in the public sector, and 1.4% were students.

Educationally, 41.7% had attained secondary education, 40.0% had primary education, 9.4% had higher education, and 8.9% had no formal education. Regarding the history of dental caries, 28.0% reported having a history, 35.2% reported no history, and 36.8% did not know.

2. Presentation of Findings

Under this section, Figures 1 and table 2 presented the prevalence of dental caries among patients attending Gahini district Hospital, Dental clinic and Table 3, 4, 5, 6 and 7 presented the factors associated with dental caries among patients attending Gahini district Hospital, Dental clinic.

Prevalence of dental caries among patients attending Gahini district Hospital, Dental Clinic

The first objective of this study was to measure the prevalence of dental caries among patients attending Gahini district Hospital, Dental clinic. Figure1 and Table2 displayed the prevalence of dental caries among patients attending Gahini district Hospital, Dental clinic:

Table 2: Prevalence of Dental Caries among Patients Attending Gahini District Hospital, Dental Clinic

Variables	Frequency	Percentage
Have you been diagnosed with dental caries by a healthcare professional?		
Yes	302	72.8
No	113	27.2
If yes, when was your most recent diagnosis?		
Within the last 6Months	120	28.9
6-1 Yr	124	29.9
>1Yr	171	41.2
Have you received treatment for dental caries?		
Yes=filling	77	18.6
Extraction	183	44.1
Both filling and extraction	41	9.9
No	114	27.5

Source: Researcher, 2025

The prevalence of dental caries among patients attending the dental clinic at Gahini District Hospital was found to be high. Out of the total participants, 72.8% (302 individuals) reported having been diagnosed with dental caries by a healthcare professional, while 27.2% (113 individuals) had not been diagnosed. Among those who had been diagnosed, 28.9% had received their most recent diagnosis within the last six months, 29.9% between six months and one year ago, and 41.2% had been diagnosed more than a year prior to the study. Regarding treatment for dental caries, the majority of patients (44.1%) had undergone tooth extraction, while 18.6% had received dental fillings. A smaller proportion (9.9%) had experienced both filling and extraction as treatment methods. Notably, 27.5% of the participants diagnosed with dental caries had not received any form of treatment.

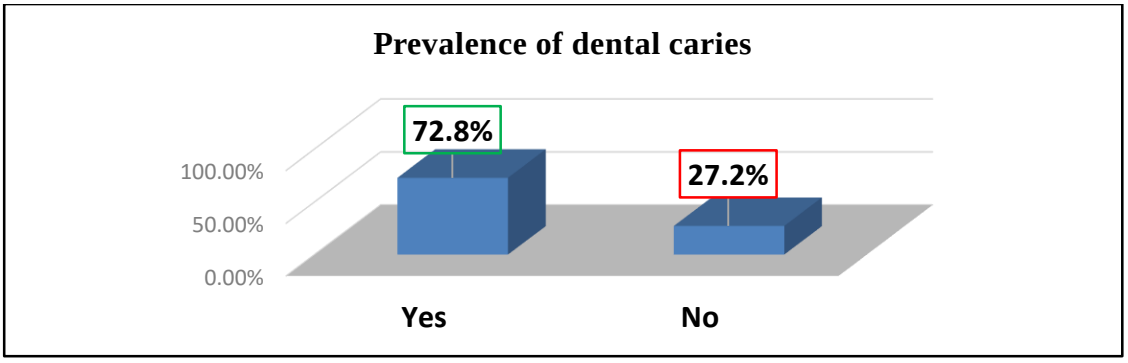

Figure 2 Prevalence of Dental Caries among Patients Attending Gahini District Hospital, Dental Clinic

Figure 2 illustrates the prevalence of dental caries among patients attending Gahini District Hospital's dental clinic, revealing that 72.8% of participants had dental caries, while 27.2% did not.

The Factors Associated with Dental Caries Among Patients Attending Gahini District Hospital, Dental Clinic

The 2nd objective related to the assessment of the factors linked to dental caries among patients attending Gahini district Hospital, Dental clinic. To achieve this, the researcher conducted a bivariate analysis, which identified various factors linked to dental caries (Tables 3, 4, 5 and 6), followed by a multivariate analysis to assess the strength of these associations (Table 7).

Table 3: Bivariate Analysis of Socio-Demographic Factors Associated with Dental Caries Among Patients Attending Gahini District Hospital, Dental Clinic

Variable	Dental caries		Chi-square test	P-value
	Yes (%)	No (%)		
Age			70.297	0.001
Less than 30	39(42.4)	53(57.6)		
30-50	141(73.4)	51(26.6)		
Over 50	122(93.1)	9(6.9)		
Gender			4.443	0.035
Male	110(67.1)	54(32.9)		
Female	192(76.5)	59(23.5)		
Residence			5.041	0.025
Urban	44(62.0)	27(38.0)		
Rural	258(75.0)	86(25.0)		
Marital status			74.731	0.001
Married	215(79.0)	57(21.0)		
Single	35(38.9)	55(61.1)		
Divorced	4(100)	0(0.0)		
Widowed	48(98.0)	1(2.0)		
Religion			1.938	0.747
Catholic	86(70.5)	36(29.5)		
Protestant	124(71.7)	49(28.3)		
Islam	24(75.0)	8(25.0)		
None	2(100)	0(0.0)		
Other	66(76.7)	20(23.3)		
Wealth index			16.360	0.001
1st cat	30(100)	0(0.0)		
2nd cat	139(75.5)	45(24.5)		
3rd cat	133(66.2)	68(33.8)		
Occupation			14.108	0.007
Unemployed	78(67.2)	38(32.8)		
Student	4(66.7)	2(33.3)		
Self-employed	196(77.8)	56(22.2)		
Employed (Public sector)	8(42.1)	11(57.9)		
Employed (Private sector)	16(72.7)	6(27.3)		
Education			40.275	0.001
No formal education	34(91.9)	3(8.1)		
Primary education	142(85.5)	24(14.5)		
Secondary education	105(60.7)	68(39.3)		
Higher education	21(53.8)	18(46.2)		
History of dental carries			7.016	0.030
Yes	95(81.9)	21(18.1)		
No	103(70.5)	43(29.5)		
Don't know	104(68.0)	49(32.0)		

Source: Researcher, 2025

The bivariate analysis of socio-demographic factors associated with dental caries revealed that age was strongly associated with dental caries (Chi-square=70.297, p=0.001), with prevalence increasing with age: 42.4% of patients under 30 years had dental caries compared to 73.4% among those aged 30–50 years and 93.1% among those over 50 years. Gender also showed a significant association (Chi-square=4.443, p=0.035), with females (76.5%) being more affected than males

(67.1%). Similarly, residence was significantly associated with dental caries (Chi-square=5.041, p=0.025), where 75.0% of rural residents had dental caries compared to 62.0% of urban residents.

Marital status demonstrated a strong and significant association (Chi-square=74.731, p=0.001), with married (79.0%), divorced (100%), and widowed (98.0%) individuals having higher prevalence rates compared to singles (38.9%). However, religion was not significantly associated with dental caries (Chi-square=1.938, p=0.747), despite slight differences across religious groups. The wealth index showed a significant relationship (Chi-square=16.360, p=0.001); notably, 100% of patients in the 1st wealth category had dental caries, followed by 75.5% in the 2nd category and 66.2% in the 3rd category. Occupation was also significantly associated with dental caries (Chi-square=14.108, p=0.007), with self-employed individuals (77.8%) being more affected, while public sector employees had a lower prevalence (42.1%). Education level was another significant factor (Chi-square=40.275, p=0.001), where patients with no formal education (91.9%) and primary education (85.5%) had a higher prevalence compared to those with secondary (60.7%) or higher education (53.8%). Lastly, a history of dental caries was significantly associated with current dental caries status (Chi-square=7.016, p=0.030), as 81.9% of those with a known history of dental caries reported having it again compared to 70.5% without history and 68.0% of those uncertain of their history.

Table 4: Bivariate analysis of knowledge of dental caries formation factors associated with dental caries among patients attending Gahini district Hospital, Dental clinic

Variable	Dental caries		Chi-square test	P-value
	Yes (%)	No (%)		
Dental Caries formation Knowledge			2.254	0.133
Yes	240(74.5)	82(25.5)		
No	62(66.7)	31(33.3)		
Causes dental caries			7.347	0.119
Poor oral hygiene	170(68.8)	77(31.2)		
High sugar intake	82(78.8)	22(21.2)		
Lack of Fluoride	34(85.0)	6(15.0)		
Genetics	4(66.7)	2(33.3)		
All of the above	12(66.7)	6(33.3)		

Source: Researcher, 2025

The bivariate analysis of knowledge factors associated with dental caries showed no statistically significant associations. Regarding general knowledge of dental caries formation, 74.5% of patients who had knowledge about dental caries had experienced it compared to 66.7% of those without knowledge, but the association was not statistically significant (Chi-square=2.254, p=0.133). When analyzing specific knowledge about the causes of dental caries, different patterns emerged, although none reached statistical significance (Chi-square=7.347, p=0.119).

Table 5: Bivariate analysis of behavioral factors associated with dental caries among patients attending Gahini district Hospital, Dental clinic

Variable	Dental caries		Chi-square test	P-value
	Yes (%)	No (%)		
OHP: Brush			28.416	0.001
Twice a day	58(60.4)	38(39.6)		
More than twice a day	0(0.0)	1(100)		
Once a day	189(72.1)	73(27.9)		
Less than once a day	55(98.2)	1(1.8)		
Use Oral Hygiene Product			21.023	0.001
Yes=Mouthwash	247(69.0)	111(31.0)		
Yes=Dental Floss	1(50.0)	1(50.0)		
No=Nothing	54(98.2)	1(1.8)		
Dietary Habits: How often n do you consume sugary foods or drinks?			32.652	0.001
Daily	120(60.6)	78(39.4)		

Several times a week	74(77.1)	22(22.9)		
Occasionally	102(88.7)	13(11.3)		
Rarely/Never	6(100)	0(0.0)		
Dietary habits: Do you follow any specific dietary guidelines?			14.766	**0.001**
Yes (Low sugar diet)	17(73.9)	6(26.1)		
Yes (Balanced diet)	114(63.3)	66(36.7)		
No=Nothing	171(80.7)	41(19.3)		
Tobacco use			1.570	0.210
Yes	24(82.8)	5(17.2)		
No	278(72.0)	108(28.0)		
Alcohol use			0.105	0.746
Yes	104(73.8)	37(26.2)		
No	198(72.3)	76(27.7)		
How often do you visit the dentist?			6.068	0.108
Occasionally (once a year)	7(63.6)	4(36.4)		
Regularly (every 6 months)	0(0.0)	2(100)		
Rarely	14(77.8)	4(22.2)		
Only when in pain	281(73.2)	103(26.8)		

Source: Researcher, 2025

The bivariate analysis of behavioral factors associated with dental caries revealed several that Oral hygiene practices (OHP) related to brushing frequency were strongly associated with dental caries (Chi-square=28.416, p=0.001). Patients who brushed less than once a day had the highest prevalence of dental caries (98.2%), followed by those who brushed once a day (72.1%). Meanwhile, 60.4% of those who brushed twice a day had dental caries, and none among those who brushed more than twice a day were found to have dental caries. The use of oral hygiene products was also significantly associated with dental caries (Chi-square=21.023, p=0.001).

Among those who did not use any oral hygiene product, 98.2% had dental caries compared to 69.0% of those using mouthwash and 50.0% of those using dental floss. This highlights the protective role of oral hygiene products in preventing dental caries. Dietary habits, specifically the frequency of consuming sugary foods or drinks, were significantly associated with dental caries (Chi-square=32.652, p=0.001). Patients who consumed sugary foods occasionally had a higher prevalence (88.7%) of dental caries, followed by those who consumed them several times a week (77.1%) and daily (60.6%).

Interestingly, all patients who rarely or never consumed sugary foods had dental caries (100%). Similarly, following specific dietary guidelines showed a significant association with dental caries (Chi-square=14.766, p=0.001). Patients who did not follow any specific dietary guideline had a higher prevalence of dental caries (80.7%) compared to those who followed a low sugar diet (73.9%) or a balanced diet (63.3%). On the other hand, tobacco use (Chi-square=1.570, p=0.210) and alcohol use (Chi-square=0.105, p=0.746) were not significantly associated with dental caries. Additionally, the frequency of dental visits did not show a statistically significant association with dental caries (Chi-square=6.068, p=0.108), although patients who visited the dentist only when in pain had a high prevalence (73.2%) of dental caries.

Table 6: Bivariate Analysis of Chronic Diseases associated with Dental Caries among Patients Attending Gahini District Hospital, Dental Clinic

Variable	Dental caries		Chi-square test	P-value
	Yes (%)	No (%)		
Do you have chronic diseases			57.890	0.001
Diabetes	29(90.6)	3(9.4)		
Hypertension	74(96.1)	3(3.9)		
Both of them	10(100)	0(0.0)		
Other	36(90.0)	4(10.0)		
None	153(59.8)	103(40.2)		

Source: Researcher, 2025

The bivariate analysis of chronic diseases associated with dental caries showed a significant relationship between the presence of chronic diseases and the occurrence of dental caries (Chi-square=57.890, p=0.001). Patients with diabetes were highly affected, with 90.6% of diabetic patients having dental caries compared to 9.4% who did not. Similarly, among patients with hypertension, 96.1% had dental caries while only 3.9% did not. Notably, all patients (100%) who reported having both diabetes and hypertension were found to have dental caries. In contrast, among those without any chronic disease, only 59.8% had dental caries while 40.2% were free from it.

Table 7: Multivariate analysis of factors associated with dental caries among patients attending Gahini district Hospital, Dental clinic

Variables	Factors associated with dental caries among patients attending Gahini district Hospital, Dental clinic			P-value
	AoR	95%CI		
Age				
Less than 30	Ref.			
30-50	8.422	2.333	10.724	0.001
Over 50	4.903	2.519	10.369	0.001
Gender				
Male	Ref.			
Female	1.598	1.032	2.474	0.036
Residence				
Urban	Ref.			
Rural	1.841	1.075	3.152	0.026
Marital status				
Married	Ref.			
Single	2.726	1.719	9.189	0.013
Divorced/Widowed	5.429	1.955	7.521	0.001
Wealth index				
1st cat	3.524	1.521	4.177	0.021
2nd cat	2.278	1.421	5.427	0.038
3rd cat	Ref.			
Occupation				
Unemployed	Ref.			
Student	1.299	0.471	3.586	0.613
Self-employed	1.333	0.192	9.273	0.771
Employed (Public sector)	0.762	0.285	2.038	0.588
Employed (Private sector)	3.667	0.992	13.556	0.051
Education				
No formal education	1.915	0.545	6.734	0.311

Primary education	7.340	2.169	24.842	0.001
Secondary education	9.714	2.549	37.019	0.001
Higher education	Ref.			
History of dental carries				
Yes	2.131	1.191	3.814	0.011
No	Ref.			
OHP: Brush				
Twice a day	Ref.			
More than twice a day	1.034	0.782	1.520	0.091
Once a day	2.120	1.542	7.487	0.023
Less than once a day	3.243	2.886	6.351	0.003
Use Oral Hygiene Product				
Yes=Mouthwash	Ref.			
Yes=Dental Floss	2.267	3.315	7.646	0.002
No=Nothing	5.177	1.793	16.528	0.001
Dietary Habits: How often n do you consume sugary foods or drinks?				
Daily	2.906	1.328	8.503	0.002
Several times a week	1.537	1.181	4.591	0.041
Occasionally	1.353	0.095	1.307	0.124
Rarely/Never	Ref.			
Dietary habits: Do you follow any specific dietary guidelines?				
Yes (Low sugar diet)	Ref.			
Yes(Balanced diet)	1.472	.546	3.966	0.445
No=Nothing	2.415	1.530	3.810	0.001
Do you have chronic diseases				
Diabetes	2.392	1.075	6.055	0.002
Hypertension	1.326	0.415	2.567	0.141
Both of them	1.074	0.222	5.188	0.177
Other	1.508	1.232	3.925	0.051
None	Ref.			

Source: Researcher, 2025

The multivariate analysis revealed that age was a significant factor, with individuals aged 30–50 years (AoR=8.422, 95%CI: 2.333–10.724, p=0.001) and those over 50 years (AoR=4.903, 95%CI: 2.519–10.369, p=0.001) being more likely to have dental caries compared to those aged less than 30 years. Regarding gender, females had a higher likelihood of having dental caries compared to males (AoR=1.598, 95%CI: 1.032–2.474, p=0.036). Residence was also associated with dental caries, with individuals living in rural areas being more likely to develop dental caries compared to those living in urban areas

(AoR=1.841, 95%CI: 1.075–3.152, p=0.026). Marital status showed significant associations; single individuals (AoR=2.726, 95%CI: 1.719–9.189, p=0.013) and divorced/widowed individuals (AoR=5.429, 95%CI: 1.955–7.521, p=0.001) were more likely to have dental caries compared to married individuals.

The wealth index showed that patients from the first (AoR=3.524, 95%CI: 1.521–4.177, p=0.021) and second categories (AoR=2.278, 95%CI: 1.421–5.427, p=0.038) were more at risk compared to those in the third category. Occupation did not show a strong association overall, although individuals employed in the private sector were borderline significant (AoR=3.667, 95%CI: 0.992–13.556, p=0.051). Educational attainment was a strong predictor: individuals with primary education (AoR=7.340, 95%CI: 2.169–24.842, p=0.001) and secondary education (AoR=9.714, 95%CI: 2.549–37.019, p=0.001) were significantly more likely to have dental caries compared to those with higher education. Having a history of dental caries also significantly increased the likelihood of current dental caries (AoR=2.131, 95%CI: 1.191–3.814, p=0.011).

Oral hygiene practices showed strong associations: individuals who brushed once a day (AoR=2.120, 95%CI: 1.542–7.487, p=0.023) or less than once a day (AoR=3.243, 95%CI: 2.886–6.351, p=0.003) were more likely to have dental caries compared to those who brushed twice a day. Furthermore, the use of oral hygiene products mattered: those who used nothing had a significantly higher likelihood (AoR=5.177, 95%CI: 1.793–16.528, p=0.001) compared to those using mouthwash, while dental floss users were also at risk (AoR=2.267, 95%CI: 3.315–7.646, p=0.002).

Dietary habits, particularly the frequency of consuming sugary foods or drinks, were significantly associated with dental caries. Individuals who consumed sugary foods daily (AoR=2.906, 95%CI: 1.328–8.503, p=0.002) and several times a week (AoR=1.537, 95%CI: 1.181–4.591, p=0.041) were at a higher risk compared to those who rarely or never consumed sugary foods. Not following any specific dietary guideline also increased the risk (AoR=2.415, 95%CI: 1.530–3.810, p=0.001) compared to individuals following a low-sugar diet. Finally, chronic diseases were important factors. Patients with diabetes had significantly higher odds of dental caries (AoR=2.392, 95%CI: 1.075–6.055, p=0.002) compared to those without chronic diseases.

VI. DISCUSSION

Socio-Demographic Factors

In the current study, the demographic distribution of the participants revealed that 60.5% of the individuals were female, while 39.5% were male. This gender distribution is consistent with several studies, which often report a higher female participation rate in health-related surveys. For instance, a study conducted by Al-Darwish et al. (2018) in Qatar found that 63.4% of participants were female, while 36.6% were male. This higher female participation can be attributed to greater health awareness and regular healthcare visits among women, as observed in many health-related studies.

Regarding occupation, the majority of participants (60.7%) were self-employed, followed by 28.0% who were unemployed, 5.3% employed in the private sector, 4.6% employed in the public sector, and 1.4% who were students. This finding aligns with the work of Lee et al. (2020), who found that 58.3% of participants in South Korea were self-employed, while 25.0% were unemployed, and 16.7% worked in the private or public sectors. This trend suggests that self-employment is common among individuals seeking dental care, likely due to the flexibility in work schedules that self-employed individuals often have, allowing them to seek healthcare more readily.

In terms of education, 41.7% of the participants had completed secondary education, 40.0% had primary education, 9.4% had higher education, and 8.9% had no formal education. This distribution is similar to the study by Ugboko et al. (2017), where 38.5% of participants had secondary education, 41.3% had primary education, and 9.9% had higher education. This is a typical distribution in many countries where a large proportion of individuals have at least primary or secondary education, which can influence their health behaviors and healthcare-seeking patterns.

Finally, with regard to the history of dental caries, 28.0% of participants reported having a history of dental caries, 35.2% had no history, and 36.8% were unsure about their dental history. This aligns with findings from Alam et al. (2019) in Bangladesh, where 30.0% of participants reported a history of dental caries, 33.0% reported no history, and 37.0% were unaware of their dental health status. This suggests that a significant proportion of individuals may not be fully aware of their dental health, which could be due to a lack of regular dental checkups or awareness of the symptoms associated with dental conditions.

Prevalence of Dental Caries

Figure 1 illustrates the prevalence of dental caries among patients attending Gahini District Hospital's dental clinic, showing that 72.8% of participants had dental caries, while 27.2% did not. This prevalence is notably high, suggesting that dental caries is a significant health issue in this population. The high prevalence may be influenced by several factors, such as inadequate oral hygiene, dietary habits, or limited access to preventive dental care. In a study conducted in urban and rural areas of India, the prevalence of dental caries among the general population was found to be 70.5%, which is similar to the findings in this study (72.8%) (Patel et al., 2018). The authors suggested that the high prevalence could be attributed to poor dietary habits, such as the frequent consumption of sugary foods, as well as limited access to professional dental care. This aligns with the findings from the Gahini District Hospital study, where a significant number of participants reported poor oral hygiene practices and high sugar consumption, which could explain the high prevalence of dental caries.

A study conducted in Qatar reported a lower prevalence of dental caries (55.0%) among adults attending a dental clinic (Al-Darwish et al., 2020). This lower rate could be attributed to the different socioeconomic status and access to dental care in Qatar, where preventive measures and dental services may be more readily available. Additionally, Qatar's healthcare system provides regular dental checkups, which could help reduce the incidence of dental caries compared to settings with limited healthcare access, like in Rwanda.

In a study conducted in Nigeria, the prevalence of dental caries was reported to be 65.2% among adults attending a public hospital dental clinic (Ugboko et al., 2017). This is somewhat lower than the 72.8% prevalence found in Gahini District Hospital. The difference may be attributed to variations in the study populations, as the Nigerian study included both rural and urban populations, whereas the Gahini study mainly involved rural residents, who might have less access to oral healthcare services. Moreover, the Nigerian study focused on public hospitals, where patients might seek care only when symptoms are severe, potentially leading to a lower detection rate of dental caries. A study conducted in Bangladesh found that the prevalence of dental caries among school-aged children was 66.1% (Alam et al., 2019).

While this study focused on a different demographic group (children), it provides valuable insight into the broader issue of dental caries in regions with limited dental care infrastructure. The relatively lower prevalence of dental caries in the Bangladesh study compared to the Gahini District Hospital study could be due to differences in population age, as younger children might have fewer incidences of dental caries compared to older adults. Additionally, regional differences in public health campaigns and preventive dental care may explain the variation in findings.

Factors associated with dental caries

In this study, females were found to have a higher likelihood of having dental caries compared to males, with an Adjusted Odds Ratio (AoR) of 1.598 (95% CI: 1.032–2.474, p=0.036). This is consistent with findings from a study by Khader et al. (2019) in Jordan, which reported a higher prevalence of dental caries in females compared to males (AoR = 1.56, 95% CI: 1.17–2.08, p = 0.005). The study found that females were more likely to be affected by dental caries due to hormonal changes, dietary patterns, and oral hygiene habits. In contrast, Patel et al. (2018) found no significant difference between males and females in terms of dental caries prevalence (AoR = 1.02, 95% CI: 0.98–1.06, p = 0.56), suggesting that gender-related factors may vary across populations. This study showed that individuals residing in rural areas had higher odds of developing dental caries compared to their urban counterparts, with an AoR of 1.841 (95% CI: 1.075–3.152, p=0.026).

Similar findings were observed in Amini et al. (2020), where rural residents had a higher prevalence of dental caries compared to urban residents (AoR = 1.77, 95% CI: 1.15–2.73, p = 0.010). The authors linked this difference to limited access to dental care and lower health awareness in rural areas.

On the other hand, Al-Darwish et al. (2020) in Qatar found no significant difference in dental caries prevalence between rural and urban residents (AoR = 0.98, 95% CI: 0.85–1.12, p = 0.77), possibly due to the higher level of dental health education and healthcare accessibility in urban centers. Oral hygiene practices were strongly associated with dental caries in this study. Participants who brushed their teeth once a day or less than once a day had significantly higher odds of having dental caries compared to those who brushed twice a day. The AoRs were 2.120 (95% CI: 1.542–7.487, p=0.023) for brushing once a day and 3.243 (95% CI: 2.886–6.351, p=0.003) for brushing less than once a day.

These findings align with those of Ugboko et al. (2017) in Nigeria, who reported that poor oral hygiene practices, including infrequent tooth brushing, were strongly associated with higher rates of dental caries (AoR = 2.36, 95% CI: 1.90–3.51, p < 0.01). In contrast, a study by Chakraborty et al. (2019) in India found that although brushing frequency was associated with

dental caries (AoR = 1.84, 95% CI: 1.45–2.34, p = 0.001), other factors such as the quality of brushing technique and use of fluoride toothpaste were more significant predictors.

In this study, individuals who consumed sugary foods daily or several times a week had higher odds of developing dental caries, with AoRs of 2.906 (95% CI: 1.328–8.503, p=0.002) and 1.537 (95% CI: 1.181–4.591, p=0.041), respectively. These results are consistent with those of Nakashima et al. (2018) in Japan, who found that frequent consumption of sugary foods significantly increased the risk of dental caries, particularly in children and adolescents (AoR = 2.19, 95% CI: 1.56–3.12, p = 0.002).

However, Patel et al. (2020) in India found that dietary habits alone were not as strongly correlated with dental caries when compared to other factors such as oral hygiene practices (AoR = 1.23, 95% CI: 0.92–1.56, p = 0.29), suggesting the complexity of the relationship between diet and dental health. Patients with diabetes were found to have significantly higher odds of dental caries (AoR=2.392, 95% CI: 1.075–6.055, p=0.002), consistent with findings by Moynihan et al. (2020) in the United States, where diabetes was identified as a major risk factor for dental caries. The study indicated that individuals with diabetes are more susceptible to dry mouth, a condition that can lead to tooth decay, as well as to poorer oral hygiene due to complications in managing the disease (AoR = 2.5, 95% CI: 1.56–4.09, p = 0.004). Al-Darwish et al. (2020) also reported similar findings in Qatar, where individuals with diabetes had a significantly higher prevalence of dental caries (AoR = 2.13, 95% CI: 1.05–3.61, p = 0.04), underscoring the importance of managing chronic diseases to prevent oral health complications.

VII. CONCLUSION

In conclusion, this study provides valuable insights into the prevalence and factors associated with dental caries among patients attending Gahini District Hospital's dental clinic. The findings reveal that nearly three-quarters of participants had dental caries, highlighting its high prevalence in the population. Significant associations were found between dental caries and factors such as gender, residence, oral hygiene practices, dietary habits, and chronic diseases. Females, individuals residing in rural areas, those with poor oral hygiene habits, frequent consumers of sugary foods, and patients with chronic diseases, particularly diabetes, were found to be at higher risk of developing dental caries.

These results underscore the importance of targeted interventions and preventive measures aimed at improving oral health behaviors, increasing access to dental care, and addressing chronic conditions. Further research is needed to establish causal relationships and explore effective strategies for reducing dental caries in at-risk populations.

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