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A study to evaluate the effectiveness of multi-component interventions on knowledge, attitude, and practice regarding the prevention of oral health hazards of tobacco chewing among adults of selected areas in Gorakhpur U.P

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Abstract
This study examines the impact of multi-component interventions on the knowledge, attitudes, and practices (KAP) regarding the prevention of oral health hazards associated with tobacco chewing among adults in Gorakhpur, Uttar Pradesh. Utilizing a pre-experimental design, 100 adult participants aged 18–58 underwent pre- and post-intervention assessments to measure changes in KAP. The intervention comprised educational videos, informational pamphlets, and peer support groups. Results indicated a 24.15% increase in knowledge, along with significant positive shifts in attitudes toward the harms of tobacco chewing and noticeable improvements in practices related to tobacco use reduction. These findings suggest that multi-component, community-based interventions can effectively increase awareness, foster healthier attitudes, and promote positive behavioral changes in tobacco use. This research highlights the need for continued public health efforts focused on educational and social support measures to reduce smokeless tobacco-related health risks in rural communities.

Keywords: Tobacco chewing, oral health hazards, multi-component intervention, knowledge, attitude, practice

Introduction
The consumption of tobacco stands as one of the leading preventable causes of mortality on a global scale. Each year, tobacco use is responsible for approximately seven million fatalities worldwide. A significant proportion, nearly 80%, of these tobacco-related deaths take place in middle- and low-income nations, where the majority of such fatalities are concentrated [1].

The World Health Organization (WHO) anticipates that by the year 2020, the proportion of fatalities attributed to tobacco-related illnesses will rise from 1.4% in 1990 to 13.3%. According to the 2018 NICPR-ICMR report, the consumption of smokeless tobacco (SLT) products, such as pan masala, gutkha, and khaini, represents a significant public health risk in India and its neighboring regions. Globally, there are approximately 360 million SLT users. The latest Global Adult Tobacco Survey India Report indicates that around 200 million individuals in India utilize SLT products, with approximately 80% of these users located in South-East Asia and 66% residing in India [2].

Nicotiana tabacum and Nicotiana rustica are the two primary species through which tobacco is derived. The volatile alkaloid nicotine is the main component of the leaves of these plants. One of the most stimulating and addictive medications is nicotine. Although nicotine affects every organ, its primary mechanism of action is the binding of a receptor in the central nervous system that connects to the brain and elevates dopamine levels, contributing to the drug's addictive properties [3]. These items consist of tobacco, nicotine, sweeteners, abrasives, salts, and more than 4,000 chemical compounds, among which are more than 30 recognised carcinogens. Smokeless tobacco provides 3 to 4 times the nicotine found in smoked tobacco, with 8 to 10 chews or dips corresponding to the nicotine levels of 30 to 40 cigarettes consumed daily [4].

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In the Indian subcontinent, the prevalence of smokeless tobacco consumption surpasses that of smoking tobacco. Age, gender, and social class significantly impact this usage. In contrast to other places, adult SLT usage is more common in Southeast Asia than smoking. When it comes to tobacco consumption among women, SLT is the most commonly used type. The use of smokeless tobacco (SLT) has various detrimental effects on oral health, including the development of leukoplakia and erythroplakia, staining of teeth and composite restorations, oral sub-mucous fibrosis when used in conjunction with areca nut, and a reduction in periodontal support [3].

Smokeless tobacco refers to tobacco products that are either chewed, sucked, or applied to the gums without undergoing combustion. Snuff, snus, and chewing tobacco are common varieties. In addition to being extremely addictive, these products include dangerous substances, such as carcinogens, that raise the risk of gum disease, mouth cancer, and other major health problems. Smokeless tobacco offers no safe level of intake and presents serious health hazards while being touted as a safer alternative to smoking [1]. Products using smokeless tobacco come in a variety of forms. Snuff, snus, chewing tobacco, and dissolvable tobacco are among them. The product for chewing tobacco is loose leaves. Another name for braided leaves is a twist. Leaves compressed, sometimes known as a plug. Tobacco chewing could have flavoring. It is between the gum and the cheek. One can spit out or swallow the saliva that accumulates in the mouth. Spitting tobacco, chewing tobacco, or spit are other names for it. Finely ground tobacco, either dry or wet, makes snuff. It comes in pouches or tin packaging. It could have flavor. A pinch of snuff is applied along the gum line, either behind the lip or in the space between the gum and the cheek. Snuff use is frequently referred to as "dipping." One can snort dry snuff. The first countries to utilize wet snuff were Sweden and Norway. It comes in pouches or loose. Pasteurization is when snus manufacturers briefly heat it to a high temperature. This technique aims to eradicate microorganisms that can create compounds that cause cancer. According to certain data, people who use snus are less likely than those who smoke to get lung cancer, heart disease, stroke, mouth cancer, and other lung issues [5].

Materials and Methods
Research Approach
This study used a quantitative approach to assess the knowledge and attitudes of adults (ages 18-58) in Gorakhpur, U.P., regarding the prevention of oral health risks associated with tobacco chewing.

Research Design
A pre-experimental, one-group pre-test and post-test design was applied. This design serves as a guide for collecting and evaluating data to address the research questions and hypotheses.

Research Setting
Data collection took place in selected areas of Gorakhpur, U.P., chosen for their relevance to the study's target demographic.

Target Population
The target population included adults aged 18-58 from areas like Dumarikhas, Shivpur, Singhariya, Kunraghat, and others within Gorakhpur, U.P.

Sample Size
The sample size consisted of 100 participants.

Sampling Technique
A non-probability purposive sampling technique was used to select participants for the study.

Results & Discussion
This study evaluated the effectiveness of a multi-component intervention in improving knowledge, attitudes, and practices (KAP) regarding tobacco chewing among adults in Gorakhpur, Uttar Pradesh. Given the high prevalence of tobacco use in India and the severe health risks associated with it, this research addresses a critical public health issue by focusing on community-based prevention strategies.

Key Findings
Demographic Distribution: The study sample comprised predominantly male participants (87%) with low educational attainment, highlighting the demographic most affected by tobacco consumption in rural India. A majority of respondents (86%) reported using smokeless forms of tobacco, primarily betel (supari), gutkha, and pan masala, with daily spending on tobacco varying between ₹20 and ₹60. The demographic insights point to the socio-economic and cultural acceptance of smokeless tobacco use, particularly among less educated and lower-income groups.

Knowledge, Attitude, and Practice (KAP) Levels
Knowledge: The intervention significantly increased knowledge about tobacco's harmful effects. Initially, only 21% of participants had adequate knowledge about the risks, but post-intervention, this rose to 83% in the "Good" category and 15% in the "Excellent" category. This highlights the effectiveness of targeted educational materials, such as pamphlets and videos, in raising awareness about health risks like oral cancers and gum diseases.

Attitude: A marked shift was observed in participants' attitudes toward tobacco use. Initially, 87% held a positive attitude, and 9% were very positive about reducing tobacco consumption. After the intervention, 84% moved to the "Very Positive" category, indicating a heightened willingness to avoid tobacco. The positive attitude shift suggests that the peer support group discussions successfully motivated individuals by allowing them to share experiences and strengthen their resolve to quit.

Practice: Behavior modification was evident, as participants reported a reduction in tobacco use frequency post-intervention. In the pre-test, 46% of respondents had "Average" practice scores, while post-intervention, 70% moved to the "Good" category. This shift underscores the role of multi-component interventions in promoting healthier habits by combining educational materials with social support.

Associations with Demographic Variables
Knowledge and Education: A significant association was found between knowledge scores and education level,

suggesting that higher education is linked to greater awareness of tobacco risks. Respondents with higher education scored significantly better in knowledge, which points to the role of education in public health awareness.

Practice and Occupation: A notable association was found between occupation and practice scores, with government and private-sector employees exhibiting better tobacco avoidance practices than daily wage earners and farmers. This association highlights the influence of occupational environments on health behaviors, where structured workplaces might discourage tobacco use compared to informal settings.

Tobacco Type and Practice: Respondents who used only smokeless tobacco had higher practice scores in avoiding tobacco than those who used both smoked and smokeless forms. This finding could indicate that users of smokeless tobacco alone may be more aware of oral health hazards and thus more motivated to reduce or quit use.

Correlations among KAP Variables
Knowledge and Attitude: A strong positive correlation between knowledge and attitude indicates that as knowledge increases, participants' attitudes become more favorable towards quitting tobacco. This supports previous research showing that increased awareness leads to greater motivation to avoid tobacco.

Knowledge and Practice: The correlation between knowledge and practice was also highly significant, suggesting that better-informed individuals are more likely to adopt healthier behaviours, such as reducing or ceasing tobacco use. This reinforces the importance of educational interventions in fostering practical, health-promoting habits.

Attitude and Practice: Positive attitudes correlated significantly with improved practices, showing that a constructive outlook on tobacco cessation often translates into action. This correlation is crucial in public health as it underscores the need for interventions that not only inform but also inspire confidence in adopting healthier practices.

The study tested a hypothesis to assess the intervention's effect on knowledge acquisition, positing that there would be no significant difference between pre-test and post-test scores. However, findings showed a significant increase in knowledge, with post-test scores rising by 52.35% to 76.50%, highlighting the intervention's effectiveness. Similar studies, such as those by Seela and Raju (2017) [6], Dar and Lone (2021) [7], and Bamalakshmi (2018) [8], also reported increases in knowledge post-intervention, underscoring the efficacy of structured training programs in raising awareness about oral cancer prevention.

In this study, practice scores also rose significantly, with an increase from 54.72% to 72.39% after intervention, mirroring findings by Bamalakshmi (2018) [8] and Seela and Raju (2017) [6] on the effectiveness of structured programs. Attitudes improved as well, with mean scores rising from 3.68 to 4.19 on a five-point Likert scale, indicating a more positive stance towards tobacco prevention. Studies by Dar and Lone (2021) [7], and Seela and Raju (2017) [6] similarly found attitude shifts post-intervention.

Significant associations were noted between knowledge scores and education and occupation levels, showing that knowledge improved with higher education and varied by occupation. This finding aligns with Seela and Raju (2017) [6], who also observed significant associations with knowledge scores and various demographics, while noting some variables, like age and gender, were non-significant.

Tables and Figures
Findings related to the sociodemographic distribution.
Sociodemographic Distribution

Table 1: Sociodemographic Distribution

Demographic Variable	N	%
Age (years)		
(a) 18 – 28	20	20.00
(b) 29 – 38	23	23.00
(c) 39 – 48	25	25.00
(d) 49 – 58	32	32.00
Gender		
(a) Female	13	13.00
(b) Male	87	87.00
Education		
(a) Illiterate	40	40.00
(b) Primary School	35	35.00
(c) High School	20	20.00
(d) Higher Sec School	4	4.00
(e) Graduate	1	1.00
(f) Post Grad Higher	0	0.00
Occupation		
(a) Service (Govt.)	3	3.00
(b) Service (Pvt.)	34	34.00
(c) Business	3	3.00
(d) Farmer	1	1.00
(e) Daily wage earner	22	22.00
(f) Unemployed	33	33.00
(g) Student	4	4.00

The sociodemographic distribution of respondents is shown in Table -1. The age-wise distribution shows that a maximum of 32% of respondents were from the 49-58 age group.

The gender-wise distribution shows that the maximum number of respondents in the sample were males. There were 87% males in the sample, whereas the proportion of females was 13%.

The distribution of respondents according to their level of education shows that the overall level of education of respondents was low. A maximum of 40% of respondents were illiterates. Overall, 95% of respondents were educated up to high school or below it. Only one respondent (1%) was a graduate, and no one was postgraduate or higher.

The distribution of respondents according to occupation shows that 34% were in private service, 22% were daily wage earners, and 33% were unemployed

Evaluate the effectiveness of a multi-component intervention on adults' knowledge, attitude, and practices regarding the prevention of oral health hazards from tobacco chewing.

Evaluate the effectiveness of a multi-component intervention on adults' knowledge regarding the prevention of oral health hazards from tobacco chewing.
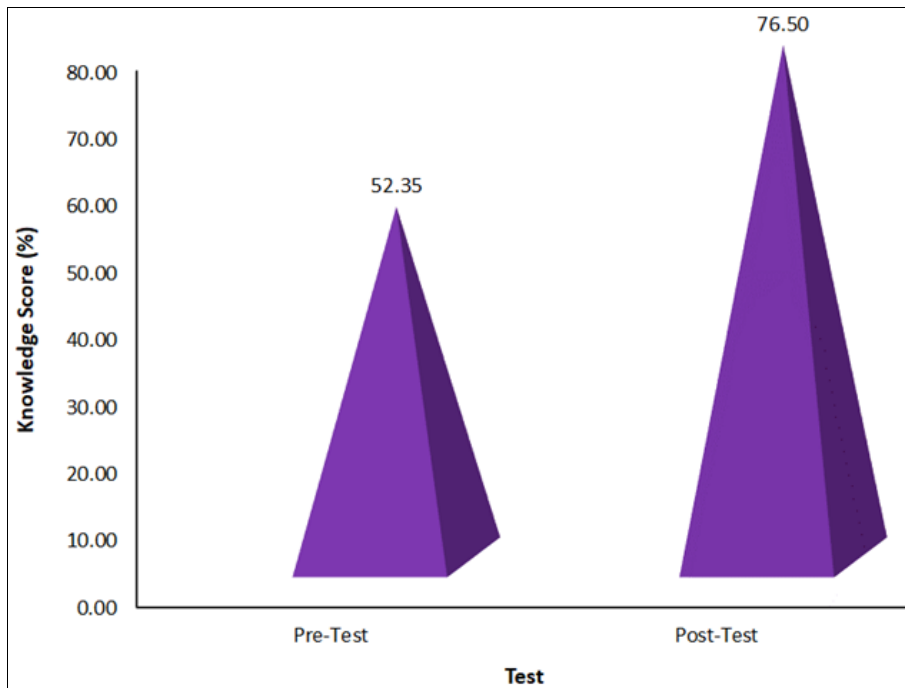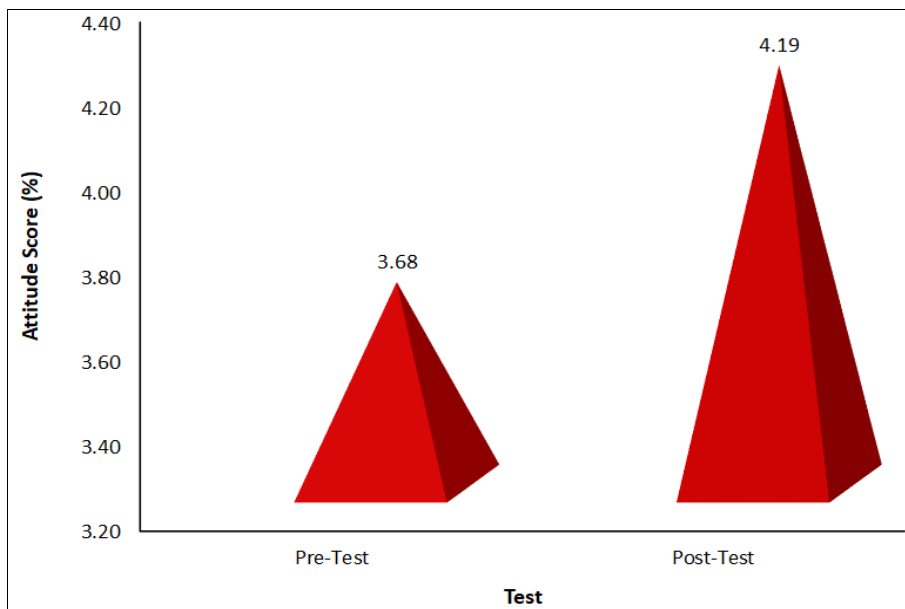
Fig 1: Test Results - Pre-test and Post-Test Knowledge Scores

The results show a significant improvement from the pre-test (Mean = 52.35, SD = 11.34) to the post-test (Mean = 76.50, SD = 6.13). The p-value (0.001) confirms this difference is highly significant, suggesting the intervention had a strong positive impact.

Evaluate the effectiveness of a multi-component intervention on adults' attitudes regarding the prevention of oral health hazards from tobacco chewing.

Fig 2: Test Results - Pre-test and Post-Test Attitude score

The data indicates a significant improvement from the pre-test (Mean = 3.68, SD = 0.30) to the post-test (Mean = 4.19, SD = 0.23). The t-value of -19.55 and a highly significant p-value (p = 0.001) confirm the statistical significance of this improvement, demonstrating the intervention's positive impact.

Evaluate the effectiveness of a multi-component intervention on adults' practice regarding the prevention of oral health hazards from tobacco chewing.

The results show a statistically significant improvement from the pre-test (Mean = 54.72, SD = 12.57) to the post-test (Mean = 72.39, SD = 9.94). The t-value of -14.74 and the highly significant p-value (p = 0.001) indicate that the intervention had a notable positive impact.
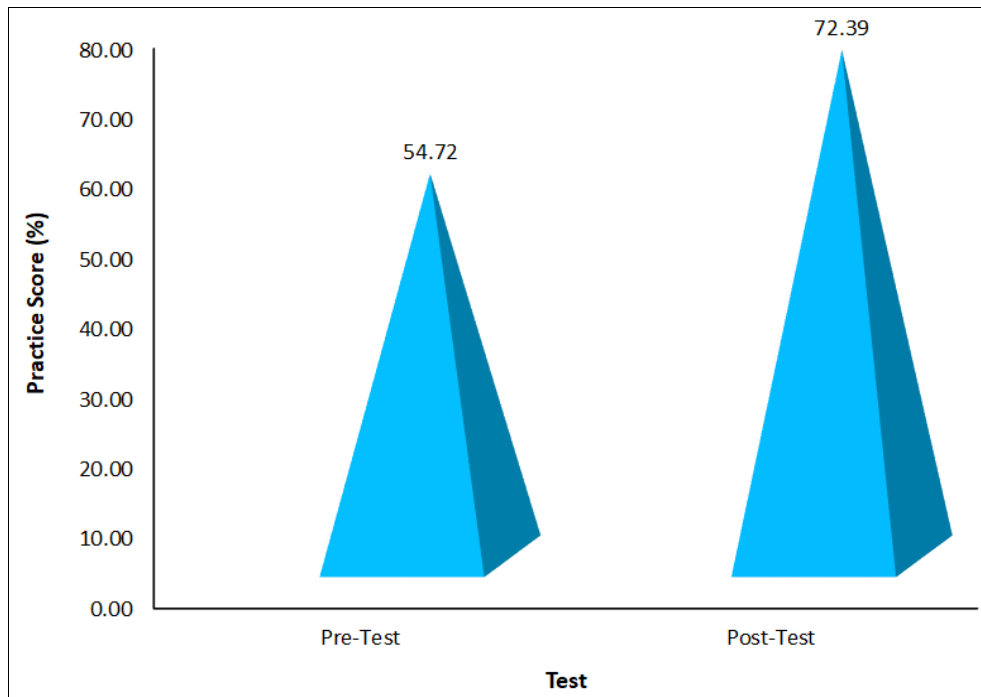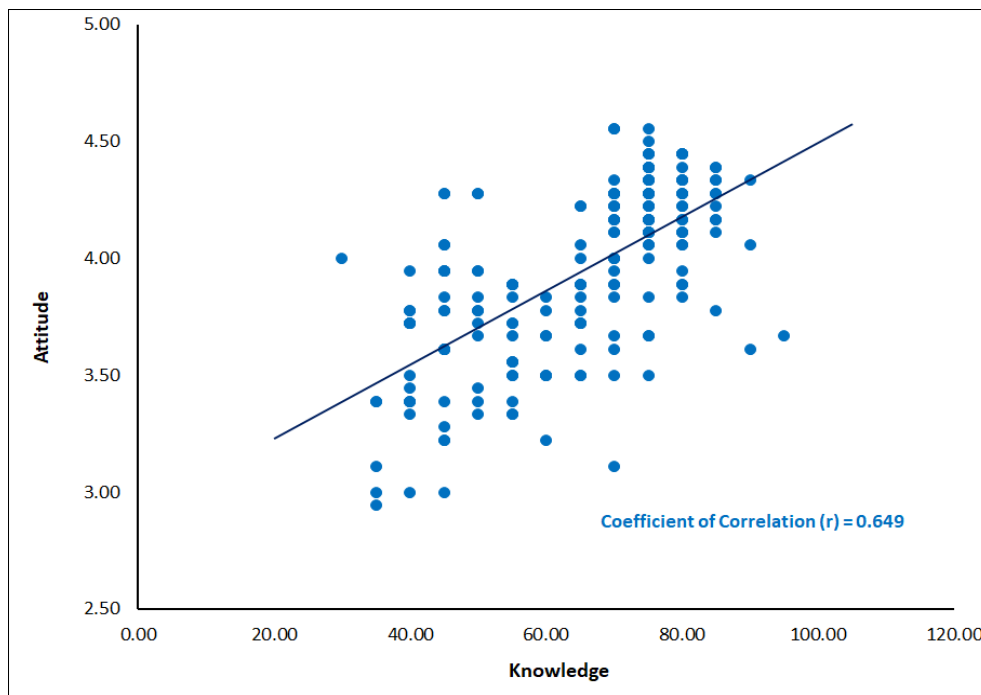
Fig 3: Test Results - Pre-test and Post-Test Practice Score

Find the correlation between the knowledge, attitude, and practices of adults regarding preventing oral health hazards from tobacco chewing. Find the correlation between the knowledge and Attitude of adults regarding preventing oral health hazards from tobacco chewing.

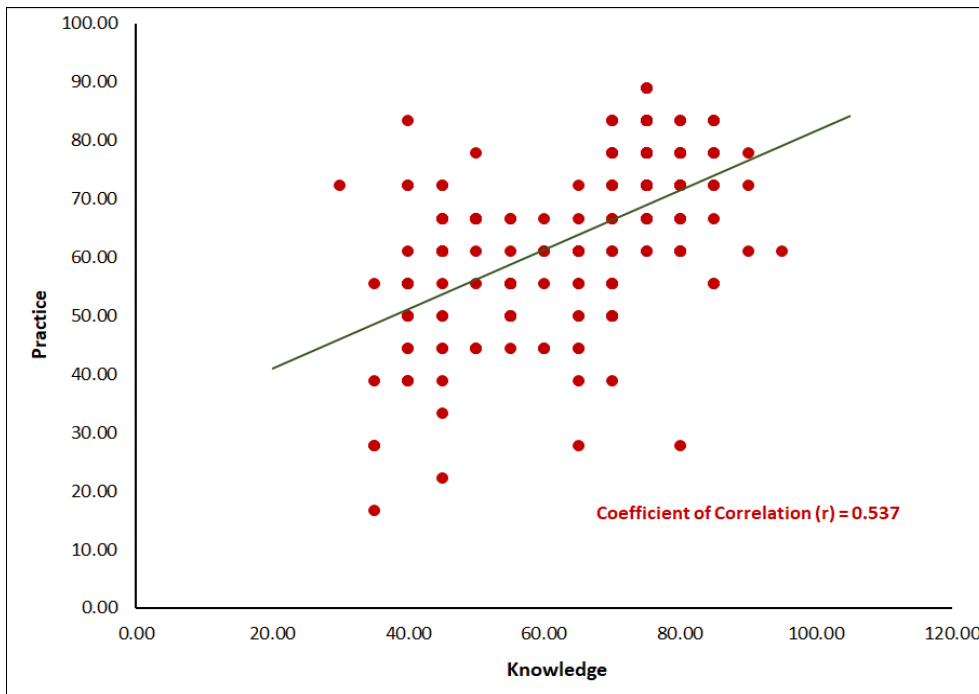**Table 1**: Tests Result - Correlation between Knowledge and Attitude

R	T	P
0.649	11.996	0.001

The results indicate a strong positive correlation (R = 0.649). The t-value (T = 11.996) and the highly significant p-value (p = 0.001) confirm that the relationship is statistically significant. This suggests a meaningful association between the variables.

Find the correlation between the Knowledge and Practice of adults regarding preventing oral health hazards from tobacco chewing.

Table 2: Tests Result – Correlation between Knowledge and Practice

| R	T	P
0.537	8.955	0.001

The results show a moderate positive correlation (R = 0.537). The t-value (T = 8.955) and the highly significant p-value (p = 0.001) indicate that this relationship is statistically significant, suggesting a meaningful association between the variables. Find the correlation between the Attitude and Practice of adults regarding preventing oral health hazards from tobacco chewing.

Table 3: Tests Result - Correlation between Attitude and Practice

R	T	P
0.646	11.894	0.001
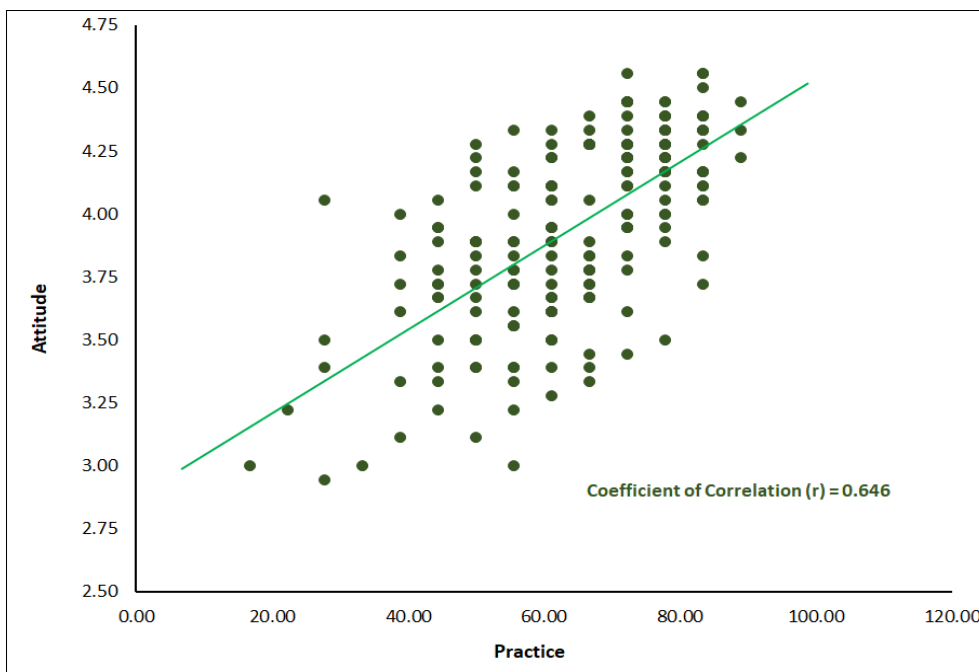
The results indicate a strong positive correlation (R = 0.646). The t-value (T = 11.894) and the highly significant p-value (p = 0.001) confirm that the relationship between the variables is statistically significant.

Section 5.5: Find The Association Between The Knowledge, Attitude, Practices, And The Selected Demographical Variable.

Association between Demographic variables and knowledge

Table 5.16: Association between Demographic variables and knowledge (n=100)

Demographic Variable	Groups	N	Mean ± SD	Test Statistic	Df	p-value
Age Group	18 – 28	20	53.50 ± 12.78	0.997	3, 96	0.398 (NS)
	29 – 38	23	55.00 ± 11.77			
	39 – 48	25	49.60 ± 11.17			
	49 – 58	32	51.88 ± 10.14			
Gender	Male	87	53.10 ± 11.47	1.737	98	0.086 (NS)
	Female	13	47.31 ± 9.27			
Education	Illiterate	40	50.38 ± 10.28	5.226	4, 95	0.001 (***)
	Primary School	35	50.57 ± 11.10			
	High School	20	54.50 ± 10.25			
	Higher Sec School	4	72.50 ± 6.45			
	Graduate	1	70.00 ± 0.00			
Occupation	Service (Govt.)	3	71.67 ± 2.89	5.498	6, 93	0.000 (***)
	Service (Pvt.)	34	54.26 ± 10.88			
	Business	3	36.67 ± 7.64			
	Farmer	1	35.00 ± 0.00			
	Daily wage earner	22	55.00 ± 11.95			
	Unemployed	33	47.88 ± 7.81			
	Student	4	60.00 ± 11.55			

The association between demographic variables and pretest knowledge scores was also determined by applying various tests. The results of tests of association between demographic variables and pre-test knowledge scores are shown in the table above. The test results show a non-significant association between knowledge score and age, pre-test knowledge score, and gender. A highly significant association was found between pre-test knowledge score and education ($p<0.001$). It is observed that the pre-test knowledge score increases with the level of education. A highly significant

A highly significant association was also found between pre-test knowledge and occupation ($p<0.001$). The knowledge score was highest for respondents who are in government services. The knowledge score of those in private service, daily wage earners, and students was also high. The knowledge score of respondents in business or farmers was significantly lower than that of other occupational categories.

Association between Demographic Variables and Attitude

Table 5.17: Association between Demographic variables and attitude (n=100)

Demographic Variable	Groups	N	Mean ± SD	Test Statistic	Df	p-value
Age Group	18 - 28	20	3.55 ± 0.32	2.164	3, 96	0.097 (NS)
	29 - 38	23	3.64 ± 0.29			
	39 - 48	25	3.74 ± 0.23			
	49 - 58	32	3.73 ± 0.33			
Gender	Male	87	3.68 ± 0.30	0.722	98	0.472 (NS)
	Female	13	3.62 ± 0.31			
Education	Illiterate	40	3.68 ± 0.33	0.938	4, 95	0.446 (NS)
	Primary School	35	3.67 ± 0.23			
	High School	20	3.69 ± 0.34			
	Higher Sec School	4	3.72 ± 0.24			
	Graduate	1	3.11 ± 0.00			
Occupation	Service (Govt.)	3	3.41 ± 0.26	2.089	6, 93	0.062 (NS)
	Service (Pvt.)	34	3.68 ± 0.30			
	Business	3	3.41 ± 0.53			
	Farmer	1	3.11 ± 0.00			
	Daily wage earner	22	3.73 ± 0.25			
	Unemployed	33	3.67 ± 0.29			
	Student	4	3.92 ± 0.10			

The association between demographic variables and pre-test attitude scores was also tested. The results of the tests of association between demographic variables and pre-test practice scores are shown in the table. The test results show a non-significant association between attitude score and all

the demographic variables, *viz.* age, gender, education, and occupation

Association between Demographic Variables and Practice

Table 5.18: Association between Demographic variables and practice (n=100)

Demographic Variable	Groups	N	Mean ± SD	Test Statistic	Df	p-value
Age Group	18 - 28	20	53.89 ± 11.27	1.035	3, 96	0.381 (NS)
	29 - 38	23	54.11 ± 12.67			
	39 - 48	25	58.44 ± 10.53			
	49 - 58	32	52.78 ± 14.53			
Gender	Male	87	54.73 ± 12.03	0.007	98	0.995 (NS)
	Female	13	54.70 ± 16.33			
Education	Illiterate	40	54.17 ± 12.88	0.224	4, 95	0.925 (NS)
	Primary School	35	55.71 ± 12.01			
	High School	20	53.61 ± 11.72			
	Higher Sec School	4	58.33 ± 22.45			
	Graduate	1	50.00 ± 0.00			
Occupation	Service (Govt.)	3	66.67 ± 14.70	2.518	6, 93	0.027 (*)
	Service (Pvt.)	34	53.27 ± 10.06			
	Business	3	37.04 ± 30.60			
	Farmer	1	38.89 ± 0.00			
	Daily wage earner	22	53.28 ± 11.71			
	Unemployed	33	57.24 ± 11.99			
	Student	4	62.50 ± 10.52			

The association between demographic variables and pre-test practice scores was also determined. The results of tests of association between demographic variables and pre-test practice scores are shown in the table. The test results show a non-significant association between practice scores and age, gender, and education. A significant association was found between pre-test practice scores and occupation ($p<$ 0.05).

5 Equations

Mean $(X) = \dfrac{\sum X}{N}$

Standard deviation (SD) $= \dfrac{\sqrt{\sum (X - X)\,2}}{N-1}$

Independent Sample t-test $\quad t = \dfrac{\bar{X}_1 - \bar{X}_2}{\sqrt{\dfrac{S_1^2}{n_1} + \dfrac{S_2^2}{n_2}}}$

Paired t-test $\quad t = \dfrac{\bar{d}}{S_d / \sqrt{n}}$

Karl Pearson's Coefficient of Correlation

$$r = \dfrac{n \sum (xy) - \sum x \sum y}{\sqrt{(n \sum x^2 - (\sum x)^2)(n \sum y^2 - (\sum y)^2)}}$$

ANOVA Table

Source of Variation	Sum of Squares	Df	Mean Sum of Squares	F-Statistics	Significance
Between the Groups	SSB	k-1	MSB = SSB/(k-1)	F = MSB / MSW	p-Value
Within the Groups	SSW	N-k	MSW =		
Total	SST	N-1	SSW / (N-k)		

Reliability

$$KR20 = \dfrac{k}{k-1}\left[1 - \dfrac{\sum_{i=1}^{k} p_i q_i}{\sigma^2}\right]$$

Sample size $\quad n = \dfrac{Z^2 \times p \times q}{e^2}$

Conclusions

The study evaluated the effectiveness of multi-component interventions on knowledge, attitude, and practices (KAP) related to preventing oral health hazards of tobacco chewing among adults in Gorakhpur, U.P. Key objectives included assessing KAP before and after intervention, testing intervention effectiveness, examining correlations among KAP, and identifying associations with demographic variables.

Data from 100 participants were analyzed, revealing a significant impact of the intervention. Knowledge scores increased by 24.15%, proving the hypothesis that post-test knowledge would improve. Practice scores increased by 17.67%, showing participants' efforts to reduce tobacco use, supporting the second hypothesis. Attitude scores also improved significantly, reflecting greater awareness of tobacco's harmful effects.

Association tests showed that knowledge was significantly related to education and occupation, and practice was linked to occupation and tobacco type, while attitude showed no significant demographic associations. A strong positive correlation was found between knowledge, attitude, and practice, underscoring the intervention's overall effectiveness in improving KAP regarding tobacco hazards.

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