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Evaluation of the Effectiveness of Plan-Do-Study-Act Cycle in Motivating and Improving the Understanding in Periodontal Disease Patients- A Service Improvement Study

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Abstract

Background: Effective patient motivation and understanding of oral hygiene practices are essential for the prevention and management of periodontal disease. Periodontal diseases are highly prevalent and largely preventable; however, inadequate patient awareness and poor oral hygiene practices contribute to disease progression. Traditional patient education relies mainly on verbal instructions, which may be insufficient to ensure comprehension and sustained behavioral change. Evidence from healthcare settings suggests that visual aids improve patient understanding, engagement, and retention of information. The use of structured quality improvement approaches, such as the Plan–Do–Study–Act (PDSA) cycle, allows systematic evaluation of educational interventions. Despite the significant burden of periodontal disease among middle-aged adults, limited evidence exists regarding the effectiveness of PDSA-based visual aids in dental education. This study evaluates the role of visual aid–assisted education in improving understanding and motivation among periodontal patients.

Methodology: 105 periodontal patients visiting Department of Public health dentistry were educated chairside using the concept of Plan-Do-Study-Act cycle

followed by Feedback questionnaire to assess the level of their understanding and motivation.

Results: Majority of the participants 89.5% were well motivated. 82.9% expressed their improved understanding to maintain their good oral hygiene and 95(90%) of them had improved understanding of gum disease after seeing the visual Aids. 92% of the patients gave their preference for use of visual aids for better understanding and motivation.

Conclusion: The visual aids can help in better understanding and motivating patient in the management of periodontitis.

Keywords: Periodontal disease, Visual aids, Oral Hygiene

Introduction

Quality is a multidimensional concept and holds different meanings depending on the role and perspective of the individual. In the broader healthcare context, quality has been defined as "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge."[1] Quality improvement (QI) forms an integral component of clinical governance and continuous service improvement in dentistry. In recent years, QI projects (QIPs) have increasingly been utilized to complement the limitations of traditional clinical audit.[1]

The Model for Improvement provides a structured framework that facilitates incremental testing of changes, followed by analysis of outcomes and learning, through the use of Plan–Do–Study–Act (PDSA) cycles. PDSA methodology remains one of the most widely adopted tools in QI initiatives.[2]

Periodontal diseases encompass pathological conditions affecting the periodontium—the supporting structures of the teeth, including gingival tissues, alveolar bone, cementum, and periodontal ligament. Gingivitis represents the mildest and most prevalent form of periodontal disease, affecting up to 90% of the population. It is a reversible inflammatory condition that resolves with improved oral hygiene practices.[3] Risk factors for periodontal disease can be categorized as modifiable (such as tobacco use, poor oral hygiene, diabetes mellitus, and pregnancy) and non-modifiable (including age and genetic predisposition).[3]

Inadequate oral hygiene practices play a crucial role in the initiation and progression of periodontal diseases. Improper brushing and plaque control result in bacterial accumulation, leading initially to gingivitis and, if left unmanaged, progression to periodontitis. This association is well documented in the literature, with increasing dental plaque accumulation directly correlating with higher severity and prevalence of periodontal disease.[3] In the Indian adult population, approximately 25% exhibit mild to moderate periodontal disease, while nearly 19% suffer from severe periodontitis.[4] Periodontal disease leads to progressive destruction of supporting tissues, adversely affects self-esteem, and significantly impairs quality of life.[5]

Despite the high burden of periodontal disease, information on oral health awareness within the Indian population remains limited. It is well established that most oral health–related conditions can be prevented or mitigated through appropriate education and awareness. Dental professionals play a vital role as oral health educators at both individual and community levels. However, understanding patients' existing knowledge, attitudes, and behaviors toward oral health is essential before implementing educational interventions. Although evidence exists regarding oral health and associated risk factors, epidemiological documentation of periodontal disease in India remains sparse.[5]

Several studies have demonstrated that patients often have limited understanding of their periodontal diagnosis and oral hygiene instructions (OHI), along with inadequate motivation to maintain optimal oral hygiene. Research in the medical field has shown that the use of visual aids can enhance patient understanding and motivation.[6] These findings prompted the consideration of visual aids as a potential intervention in periodontal care. Therefore, this quality improvement study aimed to evaluate the applicability and effectiveness of visual aid–based methods in improving patient understanding and motivation toward oral hygiene practices in dentistry.

Methodology

This service improvement study was conducted among adults aged 35–44 years attending the Department of Public Health Dentistry in a dental college setting. The sample size was calculated based on findings from a previous study by Pushpa Momin et al., in which 93% of participants preferred the use of visual aids. Using the formula $N = 4pq/d^2$, with $p = 93$, $q = 7$, and $d = 5$, the required sample size was determined to be 105 participants. Consecutive sampling was used to recruit eligible participants.

Adults who were willing to participate and who completed the questionnaire in full were included in the study. Permission to conduct the study was obtained from the Principal of Bapuji Dental College and Hospital, and the study synopsis was submitted to the Institutional Ethics Committee for ethical approval. Written informed consent was obtained from all participants after explaining the purpose and procedures of the study.

Data were collected using a structured questionnaire administered either by the investigator or self-administered by the participants. The questionnaire consisted of two sections: demographic characteristics and a validated feedback section comprising ten questions assessing participants' understanding and motivation regarding periodontal disease. A pilot study was conducted among 10 participants to assess feasibility and reliability, and a pre-validated questionnaire was used to ensure content validity. Data from the pilot participants were excluded from the final analysis. Subsequently, data were collected from 95 participants diagnosed with periodontitis or exhibiting signs of periodontal disease.

The intervention followed the Plan–Do–Study–Act (PDSA) framework. Visual aids were developed to explain the etiology and stages of periodontitis, modified brushing techniques, and the use of interdental aids. These visual aids were used during patient education sessions, and feedback was obtained immediately after the intervention. The sustainability of participants' understanding and motivation was reassessed after 30 days using the same feedback questionnaire.

Collected data were entered into Microsoft Excel and analyzed using the Statistical Package for Social Sciences (SPSS) version 21. Descriptive statistics were expressed as frequencies and percentages, and statistical significance was set at $p < 0.05$.

Results

The data from the document presents a detailed analysis of participants' responses before and after an intervention. Initially, there were 105 participants, with a gender distribution of 41.9% females and 58.1% males.

Table 1 (Pre) highlights that before the intervention, 55.2% preferred verbal methods over visual aids (44.8%). Performance and motivation levels were low, with 56.2% performing poorly, and only 37.1% being motivated. Similarly, understanding was minimal, as 70.5% were "not at all" understood, and only 29.5% were "totally" able to understood. Visual aids were

underutilized, with just 37.1% opting for them, while feedback was scarcely provided (27.6%).

In contrast, Table 2 (Post) reveals a remarkable improvement post-intervention. Visual aids became the dominant preference for 89.5% of participants, indicating a significant shift from verbal methods. Performance levels surged, with 81.0% performing "very well" and 82.9% achieving "excellent" results. Motivation levels also saw a substantial increase, as 82.9% reported feeling motivated, compared to 37.1% before. Understanding of the disease improved dramatically, with 84.8% reporting being "totally" understood. Furthermore, the use of visual aids rose to 92.4%, showcasing their effectiveness in enhancing outcomes. These findings suggest that the intervention positively impacted participants' performance, motivation, and understanding.

Table 1: Demographic Data of Study Participants

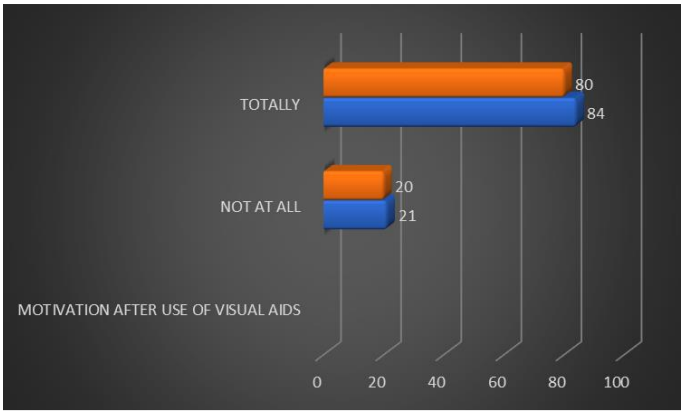
Sex	Frequency	Percent
Female	44	41.9
Male	61	58.1

Table 2: Pre Knowledge Assessment of Participants

SL.NO		FREQUENCY	PERCENTAGE
1.	VERBAL	58	55.2
	VISUAL	47	44.8
2.	POORLY	59	56.2
	VERY WELL	46	43.8
3.	POORLY	69	65.7
	EXCELLENT	36	34.3
4.	NOT MOTIVATED	66	62.9
	MOTIVATED	39	37.1
5.	NO	63	60.0
	YES	42	40.0
6.	NOT VERY MOTIVATED	86	81.9
	VERY MOTIVATED	19	18.1
7.	NOT AT ALL	74	70.5
	TOTALLY	31	29.5
8.	NOT AT ALL	78	74.3
	TOTALLY	27	25.7
9.	WITHOUT VISUAL AIDS	39	37.1
	WITH VISUAL AIDS	66	62.9
10.	NO FEEDBACK	76	72.4
	FEEDBACK	29	27.6

Table 3: Post Assessment Knowledge of Participants

SL.NO		FREQUENCY	PERCENTAGE
1.	VERBAL	11	10.5
	VISUAL	94	89.5
2.	POORLY	20	19.0
	VERY WELL	85	81.0
3.	POORLY	18	17.1
	EXCELLENT	87	82.9
4.	NOT MOTIVATED	18	17.1
	MOTIVATED	87	82.9
5.	NO	35	33.3
	YES	70	66.7
6.	NOT VERY MOTIVATED	17	16.2
	VERY MOTIVATED	88	83.8
7.	NOT AT ALL	16	15.2
	TOTALLY	89	84.8
8.	NOT AT ALL	21	20.0
	TOTALLY	84	80.0
9.	WITHOUT VISUAL AIDS	8	7.6
	WITH VISUAL AIDS	97	92.4
10.	NO FEEDBACK	93	88.6
	FEEDBACK	12	11.4



Graph 1: Motivation after the use of visual aids

Discussion

The present study evaluated the effectiveness of the Plan-Do-Study-Act (PDSA) cycle in motivating and improving the understanding of periodontal disease patients using visual aids. The findings indicate a significant improvement in patients' knowledge, motivation, and improvement with oral hygiene practices post-intervention.

Comparison of Pre- and Post-Intervention Data

The pre-intervention data indicated that verbal explanations alone were insufficient for effective patient education. The results showed that 55.2% of participants initially relied on verbal methods, while only 44.8% preferred visual aids. Additionally, motivation and understanding levels were low, with 37.1% feeling motivated and only 29.5% improved in oral hygiene practices. Furthermore, only 37.1% of participants utilized visual aids, demonstrating a gap in their accessibility and application.

Following the intervention, there was a significant shift in patient preference towards visual aids, with 89.5% of participants favouring them over verbal explanations. Performance and motivation levels also showed remarkable improvement, with 81% performing very well and 82.9% achieving excellent results. Additionally, 82.9% of participants reported feeling motivated, compared to 37.1% before the intervention. Improvement levels surged, with 84.8% of participants being totally improved in oral hygiene practices. The utilization of visual aids increased to 92.4%, reinforcing their effectiveness in enhancing patient education and motivation.

Supporting Evidence from Literature

The results of this study align with previous research highlighting the benefits of visual aids in improving patient understanding and motivation. A study by Pushpa Momin and Sophina Mahmood (2020) demonstrated that visual aids significantly enhanced patient motivation and comprehension of periodontal disease. Their findings indicated that 100% of participants preferred their diagnosis to be explained using visual aids, similar to the post-intervention results of the present study.[6]

Furthermore, a study by Katja Goetz et al. emphasized the role of structured quality management programs in improving patient outcomes in dental care. Their research found that implementing a quality improvement initiative led to better organizational quality and enhanced patient engagement, further supporting the effectiveness of the PDSA cycle in this study.[7]

Additionally, research by Heather Cassie et al. on the Scottish Patient Safety Programme demonstrated that applying quality improvement methodologies led to increased knowledge, skills, and confidence in healthcare settings. These findings reinforce the benefits of incorporating structured improvement cycles, such as PDSA, in dental practice to enhance patient education and care outcomes.[8]

Implications and Recommendations

The findings of this study underscore the importance of incorporating visual aids into patient education programs for periodontal disease management. Given the significant improvement observed in patient motivation and understanding, dental practitioners should consider

adopting visual aids as a standard practice in oral health education.

Moreover, continuous assessment and feedback mechanisms should be implemented to sustain the effectiveness of visual aids in patient education. Further research with larger sample sizes and diverse populations is recommended to explore the long-term impact of visual aids on patient adherence to oral hygiene practices.

Conclusion

The PDSA cycle, incorporating visual aids, proved to be an effective strategy for improving patient motivation and understanding of periodontal disease. The shift from verbal methods to visual aids significantly enhanced patient engagement, reinforcing the need for innovative approaches in dental education and quality improvement initiatives.

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