Narrative Review Article

Impact of Motor Symptoms on Oral Hygiene in Parkinson's Disease Patients

Riya Rajesh

Northern Highlands Regional High School, 298 Hillside Ave, Allendale, NJ 07401, United States

ABSTRACT

Currently, over 1.1 million Americans are fighting a daily battle with Parkinson's disease (PD). PD is the second most common neurodegenerative disorder characterized by motor and nonmotor symptoms. In the United States, the economic burden of the disease is estimated to be $52 billion annually. Those numbers indicate the financial costs a society or individual incurs due to direct healthcare costs (medications and hospital visits) and indirect costs (expenses for caregivers and wages lost due to inability to work). Oral health is an essential aspect for high quality of life, but PD patients are at a disadvantage when it comes to maintaining their oral health. However, despite its importance, very few studies have investigated oral health in PD patients, largely overlooking this aspect of their well-being. This article examines how PD motor symptoms affect oral hygiene in patients. To obtain evidence for the effects of PD symptoms on oral hygiene, four studies were reviewed. These studies collectively show that oral health is compromised in PD patients with individuals facing difficulty chewing and swallowing, carrying out routine practices such as tooth brushing, and accessing dental care.

Keywords: Parkinson's Disease; Oral Hygiene; Neurodegenerative Disorders; Dental Care; Oral Health

INTRODUCTION

Globally, 10 million people are living under the shadow of PD. As the second most common neurodegenerative disease, PD represents a major cause of morbidity and disability worldwide (1).

PD is a progressive neurodegenerative disorder. The disease is characterized by a variety of motor symptoms, including, but not limited to, involuntary shaking of particular parts of the body, slow movement, and inflexible muscles. Non-motor symptoms are also present. Sleep behavioral disorder, constipation and apathy are a few. The biggest risk factor for the disease is age, as prevalence rises markedly in older populations (2).

Diagnosis of PD is mostly clinical with a healthcare provider examining the symptoms of the patient, asking questions, and reviewing medical history (9, 10). PD occurs due to the selective death of dopaminergic neurons in the substantia nigra, leading to a dopamine deficit in the striatum. Dopamine is a catecholamine neurotransmitter in the mammalian brain, where it controls locomotor activity, cognition, emotion, positive reinforcement, food intake, and endocrine regulation functions. The neurotransmitter is also involved in cardiovascular function, catecholamine release, hormone secretion, vascular tone, renal function, and gastrointestinal motility, making it crucial for diverse physiological processes (3).

Corresponding author: Riya Rajesh, E-mail: riya.rajesh.ri@gmail.com.

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The pathological hallmark of PD is the accumulation of Lewy bodies and Lewy neurites in the affected regions of the brain. Lewy bodies, and Lewy neurites which are fibrous protein deposits, are primarily made of alpha-synuclein (α-synuclein) (4), a neuronal protein involved in neurotransmitter release (5).

Most PD cases are sporadic (idiopathic) with familial forms only accounting for 10% of PD cases. This means that most cases have no known genetic link and a few are inherited. Mutations in *SNCA* (autosomal dominant), *LRRK2* (autosomal dominant), *PRKN* (autosomal recessive), *PINK1* (autosomal recessive), and *DJ-1* (autosomal recessive) have been identified as major genetic causes of familial PD. According to a prospective study of familial versus sporadic PD, the phenotypic characteristics of motor signs and symptoms of the disease are similar between both types of cases (11).

In PD, clinical focus is often centered on motor symptoms, which can cause the impact of the disease on oral health to be neglected. Consequently, oral health is rarely considered when discussing or managing PD, despite its significant implications for patients' overall well-being. Oral health encompasses a variety of practices that not only affect teeth and gums but overall health as well. Daily hygiene practices maintain clean teeth, fresh breath, and reduce bacteria for a healthy smile. This can be done by attending routine dental checkups, professional cleanings, and eating a diet rich in vitamins and minerals (calcium and Vitamin D) for strong bone health. Healthy teeth and gums reduce one's risk of cavities, gum disease (periodontitis), and infections. When these oral problems arise and are not treated, pain, bone damage, and tooth loss can occur. Since the mouth is full of bacteria, disease and infection present in the mouth can cause harmful bacteria to enter the bloodstream and spread to other parts of the body. Cardiovascular disease, diabetes complications, and respiratory illnesses can arise. Oral infections can trigger widespread inflammation, which worsens neurological symptoms and inhibits the body's ability to fight off other infections. In addition, strong teeth allow for proper chewing, which is vital for digestion and nutrition. Furthermore, speech is dependent on proper alignment of the teeth, lips, cheeks, and tongue. Oral health is especially important in the elderly, who may already have issues with malnutrition, are more susceptible to infections, and are becoming more dependent on other people, requiring more social interactions (12). This review aims to investigate how motor symptoms present in PD affect oral hygiene.

OVERVIEW OF ORAL PRACTICES AND HOW THEY ARE AFFECTED BY PD MOTOR SYMPTOMS

Motor symptoms experienced by PD patients include tremors, bradykinesia, drooling, and facial masking. Tremors are the most common motor symptom of PD, affecting about 75% of patients. They involve the involuntary shaking movement of a body part due to the muscles contracting and relaxing repeatedly (14). Bradykinesia refers to the slowness of movement. Upper limb functions are significantly impacted, making it difficult to perform everyday tasks and causing a higher sense of dependence on others. Sialorrhea (or drooling) in PD is primarily linked to difficulties with speech and swallowing, which result from the reduced muscle movement characteristic of the condition. Hypomimia, reduced facial expressions, is another symptom of PD and occurs when the face muscles are too stiff, making it harder to move and causing rigidity. This section explores how these symptoms affect the ability of PD patients to carry out the oral practices outlined below.

Brushing & Flossing

Brushing teeth is recommended at least twice a day with fluoride toothpaste and a soft-bristled toothbrush to remove plaque and bacteria at the gum line. Along with brushing, flossing is suggested to be done at least once a day. The purpose is to remove food, debris, and biofilm from teeth surfaces (30, 31). In PD patients, these practices of brushing and flossing become difficult due to tremors in the hands, head, and face. According to a retrospective study, two-thirds of PD patients failed to replace their toothbrush heads for 8 weeks and most brushed for less than 2 minutes. Gum damage and pain can result in PD patients from their inability to guide their hands with stability (32). An electric brush may be recommended for PD patients as the thick handle facilitates gripping. Similarly, a flossing device with a thick handle, an electric flosser that uses air or water, or interdental brushes can simplify the task for patients experiencing tremors (33).

Dental Appointments

Routine dental exams and cleanings are recommended every 6 months (30). As the dental hygienist cleans the teeth and the dentist performs the checkup, the patient is required to remain seated in the treatment chair with the mouth open for 30 minutes to an hour. The process incorporates a series of steps: scaling, polishing,

preventive treatments, and dental X-rays (34). Dental X-rays are needed every 6 to 36 months, and for this process, patients are required to sit or stand in front of the X-ray machine as a film or sensor is positioned. The body, which is covered in a lead apron and thyroid collar around the neck, must stay still throughout the process (35). Involuntary movements significantly impair the ability of most patients with PD to remain still. Furthermore, most dentists are not trained to treat PD patients with the appropriate care necessary for the symptoms of tremors, bradykinesia, and excessive drooling. Moreover, 20% of PD patients have temporomandibular joint disorders (TMD), which cause limited maximum unassisted jaw opening, lateral movement, and protrusion. The difficulty that affects individuals when trying to keep their mouth open or stay still inhibits the dental professional's ability to provide proper oral care. Aspiration and ingestion of dental instruments is another possibility of risk. During scaling, the dentist or hygienist will use scalers to remove plaque and tartar from the surfaces of the teeth. Since this involves the usage of sharp tools, the soft tissues in the mouth can easily be damaged with uncontrolled movement of the patient. A negative experience with the dentist due to excessive drooling and tremors can cause "dental anxiety" for PD patients as well, reducing their likelihood of returning for checkups and further impacting oral health. Appointments were found to be easier in the morning after PD medication is taken. Additionally, limiting appointments to 45 minutes or less is preferable due to the reduced duration required to remain seated (32).

Mouthwash

To remove food, debris, and plaque buildup, antibacterial mouthwash helps prevent and reduce oral bacteria growth (30). Typically, 20 milliliters of mouthwash are dispensed into a cup, introduced into the oral cavity, swished for 30 seconds, and then expelled (36). To perform this action, the buccinator muscles, which form the walls of the cheeks, are utilized. They compress the cheeks against the teeth to create a pressure that allows liquid to be propelled, prevents liquid from escaping into the oral vestibule, and controls airflow in the mouth (37, 38). The intrinsic tongue muscles allow the tongue to be shaped in ways to manipulate the liquid, while the extrinsic tongue muscles move the tongue up and down for the liquid to move side to side. The orbicularis oris allows the lips to close, preventing the liquid from spewing out. Mastication muscles are used for chewing and jaw movements, which also assist in the swishing motion (39, 40). Swallowing dysfunction, bradykinesia, and facial masking impact PD patients' ability to use mouthwash, increasing the risk of choking. In addition, the lack of strength or coordination between the muscles of the mouth, face, and throat increases the difficulty of controlling the liquid in the mouth. With abnormal amounts of saliva in the mouth, controlling extra liquid from the mouthwash adds another challenge. Due to these obstacles, it is possible that the mouthwash enters the windpipe as opposed to the esophagus, causing aspiration or a lung infection (32).

Retainers & Dentures

Dentures are false, removable teeth made of metal, acrylic, or nylon that fit over the gums to cover missing gaps between the teeth. Retainers are used after the removal of braces or Invisalign to maintain the alignment of teeth. Teeth can easily shift back to their original form during the day, so retainers are devices typically worn throughout the night to keep teeth aligned from orthodontic treatment (41). Excessive drooling and rigid muscles can create challenges with denture retention and control. Furthermore, placing and removing dentures or retainers is made challenging with involuntary muscle movements. Denture stability relies on precise control of oral muscles, a function that is frequently compromised in PD patients. Drooling also inhibits the stability of the denture. Bradykinesia and tremors can make it difficult for the retainer or denture to stay in place (42). Dexterity may result in the denture or retainer not fitting properly, which is equivalent to not wearing the appliance at all. The use of the appliance would provide no clinical benefit, resulting in unnecessary expenditure of time and money (33).

ORAL HYGIENE IN PD PATIENTS

Several studies demonstrated that PD patients exhibit reduced oral hygiene because of their condition. The motor symptoms and disease-related complications present challenges in maintaining oral health. Across multiple studies, common themes emerge, including barriers to oral hygiene practices, swallowing difficulties, limited access to dental care, as well as limited oral health knowledge, as summarized in Table 1.

Barriers to oral hygiene practices are consistently reported. In a cross-sectional study conducted by Ge *et al*., it was observed that patients with higher motor impairment had poorer oral hygiene, more untreated caries, and advanced periodontal disease, with 38.7%

Table 1. Overview of studies examining oral hygiene in PD patients.

Study	Design & Participants	Functional Barriers (Brushing, Dentures, Swallowing)	Access to Dental Care & Oral Health Knowledge	Oral Health Status & Clinical Findings
Ge *et al*. (2025) (44)	Cross-sectional; 424 PD patients (median age 63)	More decayed teeth correlated with chewing/ swallowing difficulties	18.9% never visited dentist	75% had periodontitis; poorer hygiene and more untreated caries with higher disease severity
Barbe *et al*. (2016) (45)	Cross-sectional survey; 100 PD patients (mean age 71)	29% limited in performing hygiene; none flossed or used adaptive devices for reduced dexterity	Most had a dentist but only 6.1% were counselled on xerostomia and 4.1% used symptom-relieving products	Worse oral health-related quality of life with oral symptoms xerostomia, drooling, dysphagia
Nakayama *et al*. (2005) (46)	Case-control; 104 PD patients vs. 191 controls (≥ 60 years old)	49% had trouble cleaning dentures; 35% had difficulty brushing independently; 54% reported swallowing difficulty	48% needed assistance; 10% could not visit at all; 60% wanted home-visits; limited oral health knowledge	More chewing difficulty, denture discomfort, tooth loss, and poor hygiene in PD
Haralur (2015) (42)	Case report; 65-year-old PD patient	Slight difficulty swallowing due to early bradykinesia	-	Effective denture improved mastication, speech, and psychological state

This table summarizes findings from four studies examining how PD impacts oral health status, functional limitations (e.g. brushing, swallowing), and access to dental care & oral health knowledge. One study additionally describes the steps and clinical strategy for complete denture rehabilitation in a PD patient. Collectively, these studies emphasize that PD motor symptoms and disease-related complications impair oral health and highlight the need for targeted strategies to support treatment and patient as well as caregiver education.

brushing less than twice daily. Similarly, Barbe *et al*. found that 29% of patients had limited ability to perform oral hygiene, and out of all the patients included in the study, none used dental floss or adaptive devices, suggesting functional limitations as a result of PD. The case control study conducted by Nakayama *et al*. reported that 49% of PD patients struggled with brushing or cleaning dentures, while 35% of dentate PD patients had difficulty brushing independently, emphasizing the need for caregiver support.

Swallowing challenges also significantly impacts on oral health and overall quality of life. Dysphagia was reported in 47% of patients in Barbe *et al*., while Ge *et al*. linked more decayed teeth with chewing and swallowing difficulties. Similarly, Nakayama *et al*. found that 54% of PD patients experienced swallowing problems.

Limited access to dental care and limited oral health knowledge represent additional barriers. Nakayama *et al*. highlighted that only 30% of PD patients could visit a dental clinic unassisted, 48% required assistance, and 10% could not attend at all, while very few PD patients knew about dental floss (3%), denture brushes (19%), or tongue coating (14%). Despite most patients having a regular dentist, Barbe *et al*. noted that very few received guidance for managing xerostomia, demonstrating gaps in professional support.

Collectively, these three articles agree on the basis that poor oral health in PD patients significantly affects their quality of life and overall well-being and that targeted interventions are needed to overcome these issues. Ge *et al*. highlighted that PD medical management teams need to pay careful attention to their patients' oral health to avoid extreme oral deterioration. Since the study has a cross-sectional design, more longitudinal research would be needed for evidence-based guidelines for integration of oral care into professional general health care for

PD patients. The study by Nakayama *et al*. concurs by adding that the findings of their study may be useful for PD patients' caregivers to develop oral health plans and medical/welfare services for better overall oral health. The findings apply to dental staff as well, who can assist by training caregivers, improving PD oral health knowledge, and providing dental checkups at home for PD patients. With no cure for PD, the motor symptoms persist and worsen. Thus, the only way to protect the oral health of PD patients is for dental care to work around the limited motor of the patient and assist in the preservation of their teeth (44, 45, 46).

Some dental care interventions that can be employed for PD patients were described in the study by Haralur. The study focused on one patient in the evaluation of how to alter the use of dentures to accommodate PD patients and the effect of doing so. The study demonstrated that the fabricated complete dentures were retentive and functional and that the treatment improved the patient's masticatory efficiency, speech, and psychological state. Steps and clinical strategies described in this study that might be beneficial for other PD patients undergoing such procedures include advising patients to take the PD medicine (Levodopa) one hour prior to treatment, fixing appointments for the short duration of 45 minutes, and adjusting the dental chair with inclination at 45 degrees to facilitate swallowing. It further suggests that a multitude of PD patients require complete denture rehabilitation for functional, aesthetic, and psychological improvement. Notably, complete dentures are only successful in conjunction with patient motivation to follow up with the process (42).

CONCLUSION

Across the studies reviewed in this article, it was shown that PD significantly affects oral health due to motor symptoms, which prevent patients from performing oral hygiene practices, swallowing effectively, and accessing appropriate dental care. In certain cases, lack of oral health knowledge and inadequate guidance from dental professionals further affect oral health in PD patients.

These findings underscore important clinical implications. Dental professionals and PD care teams must adopt an approach that involves patient education and individualized support. Practical strategies, such as adaptive hygiene devices, timed medication, shorter dental appointments, properly designed dentures, and caregiver training, can improve oral health and quality of life in PD patients.

Future research should focus on longitudinal studies to better understand the progression of oral health in PD patients and to evaluate the effectiveness of targeted interventions.

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CONFLICT OF INTEREST

The author declares that there are no conflict of interest related to this work.

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