The Impact of Health Work Management and Dentist Profiles on Dental Teams' Performance

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Abstract
Background:
Primary health care (PHC) is vital to healthcare systems, offering accessible and integrated services. The National Oral Health Policy (NOHP) emphasizes the importance of skilled dental teams and the provision of adequate resources for effective service delivery. However, factors such as the profile of dentists and health work management influence the performance of dental teams. This study investigates how these factors impact dental team performance in the public healthcare system, focusing on regional differences.
Methods:
A total of 18,114 dental teams were evaluated on access to and the quality of dental care. The dependent variable was "dental team performance," measured using psychometric analysis, and independent variables included dentists' profiles and health work management factors. Univariate and multiple linear regression models were employed for data analysis.
Results:
Regional variations were observed in both dentists' profiles and health work management factors. Significant factors associated with improved dental team performance included graduate studies, continuing professional development training, mentoring, public sector employment, and career plans linked to service time and financial rewards. Work management-related variables, such as monitoring healthcare indicators and flexible scheduling, also positively influenced performance. These variables explained approximately 22% of the variation in dental team performance, with regional differences in the factors that influenced performance.
Conclusion:
Dentists' profiles and health work management significantly impact dental team performance. Regions with more access to professional development and favorable work conditions reported better outcomes. The findings highlight the importance of continuous professional development and improved employment conditions for enhancing the performance of dental teams in PHC settings.

Introduction
Primary health care (PHC) plays a pivotal role in the healthcare system, offering citizens access to health promotion, prevention, and treatment through integrated services, all free at the point of delivery. The National Oral Health Policy (NOHP), established in 2004, defines the inclusion and organization of dental teams within this system, outlining strategies to enhance the quality and reach of healthcare services provided to the population (1–3).
The NOHP emphasizes the importance of ongoing professional development and the need for a skilled dental workforce to meet local demands. It also highlights the significance of conducting territorial and epidemiological analyses to properly plan and allocate oral healthcare services. This alignment is crucial, particularly given the notable sociodemographic disparities across different regions (4). Additionally, ensuring adequate working

conditions, including suitable dental facilities and a full supply of necessary materials and equipment, is fundamental for the effective functioning of dental teams (1, 3).

Research indicates that while structural and organizational factors impact healthcare delivery, workforce-related elements, such as professional training, salary, work hours, and employment status, also play a significant role (5, 6). Over the past few decades, increasing job instability, informal work arrangements, and declining wages, driven by neoliberal employment policies, have affected the workforce within the healthcare system (7, 8). These factors may also influence the quality of care delivered.

To improve both access to and the quality of services, the Ministry of Health implemented the "National Programme for Improving the Access and Quality of Primary Care—PMAQ-AB" between 2011 and 2018. Participation in the program was voluntary, and teams that performed well in evaluations received financial incentives. The assessment of dental care services focused on the structure of primary care units, availability of dental instruments, procedures performed, dentist profiles, and the organization of services (9).

Initial findings from the second evaluation cycle of PMAQ-AB, conducted between 2013 and 2014, revealed a need to expand the provision of dentures and prosthetic services (10). Psychometric analysis of questions related to dental procedures produced a "dental team performance" score ranging from -3.66 to +1.87 (mean: -0.06; median: +0.01). These findings showed that negative performance scores were more pronounced, especially between -2 and -3 (11). These preliminary analyses laid the groundwork for the present study, which aims to evaluate how the profile of dentists and health work management affect the performance of primary care dental teams. First, at the national level, and second, by geographical region. The null hypothesis suggests that neither dentists' profile nor work management influence the performance of dental teams on national or regional levels.

While prior studies have evaluated the same dataset to assess healthcare system performance (12, 13), this is the first study to propose a methodology for estimating the dependent variable through psychometric analysis. It also examines how the characteristics of dentists and the organization of health services influence these outcomes.

Given that the healthcare system recently marked its 30th anniversary, and the NOHP is only 16 years old (1, 3), continuous evaluation and refinement remain essential. Understanding how the profile of dentists impacts the performance of dental teams is crucial for improving healthcare services. Identifying factors related to ongoing professional development, employment contracts, and career advancement will enable greater emphasis on supplementary training and internal professional development within the system. Moreover, the formulation of new public policies that provide more employment stability for healthcare workers can also be considered.

Methods

Among the 22,260 dental teams working in the public healthcare system, 18,114 (78.2%) teams were evaluated based on their access to and quality of dental care provided to the population (9).

The data for this study were sourced from the survey program, which involved face-to-face interviews with a dental representative from each primary health care unit. These questions were based on the principles of primary health care and Donabedian's health services evaluation model, focusing on structure, process, and outcomes (14).

The dependent variable in this study was "dental team performance," derived from dentists' reports on the execution of 20 required dental procedures in primary health care, as detailed in our previous publication (11). The procedures covered a range of common dental practices, including preventive, restorative, surgical, and endodontic treatments, as well as the identification, referral, and monitoring of oral cancer cases.

These 20 procedures were assessed using item response theory (IRT), a mathematical framework that links the probability of a response to an item with its latent trait (15). The latent trait in this study was the "dental team performance," with a score ranging from -4 to +4. The IRT model estimated the psychometric properties of the items, assigning a single performance score to each evaluated dental team in the second cycle of PMAQ-AB. Dental team scores in this analysis ranged from -3.66 to +1.87 (mean = -0.06; median = +0.01) (11, 15).

The independent variables were divided into two categories: 13 questions related to the dentist's profile (factors concerning human resources) and 11 questions about the health work management of the dental teams (Table 1). Most of the variables were categorical (22 questions), which were dichotomized (yes/no) for statistical analysis. The variable "continuing professional development training" was quantitative, ranging from 0 to 8, depending on the number of activities the dentist participated in. The "covered population" variable ranged from 1 to 9, based on the number of primary health care teams served by the dental team (each team covering approximately 3,500 patients).

Statistical Analysis

The estimation of the dependent variable, "dental team performance," was previously described by Mendes et al. (10). For the independent variables, a univariate analysis was performed to calculate frequencies, both absolute and relative. Bivariate analysis was conducted using linear regression. Initially, each of the 24 independent variables was entered into simple linear regression with the dependent variable, "dental team performance" scores, as estimated by

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IRT. Variables with p-values ≤ 0.20 were then included in a multiple linear regression model. Only variables with statistical significance (p ≤ 0.05) were retained in the final adjusted model. Collinearity was assessed using the variance inflation factor (VIF), with values below 2 considered acceptable.

Given the significant socioeconomic and healthcare access disparities across different regions, a regional analysis was also conducted. The multiple linear regression model was applied separately for each geographical region— North, Northeast, Center-West, Southeast, and South. The beta coefficients and their confidence intervals are presented for variables that reached statistical significance (p ≤ 0.05) in the final model for each region.

To assess the residuals, both standardized and studentized deleted residuals were examined through histograms and normal probability plots to check for theoretical assumptions. Homoscedasticity was verified, and the normality of the residuals was assessed visually through the histogram. The final model summary for each regression analysis was calculated to determine how well the independent variables could explain the variation in dental team performance.

Data were organized, dichotomized, and analyzed using IBM SPSS Statistics version 25 (IBM Corp., 2017).

Table 1. Questions of the independent variables, related to dentists' profile and health work management of the dental teams, and the possible answers.

Dentists' profile
1. Does the dentist have graduate studies? Yes; No.
2. Does the dentist have master's degree and/or doctoral studies? Yes; No.
3. Does the dentist tutor undergraduate students? Yes; No.
4. What was the hiring process of the dentist? Public tender test; Other.
5. Which employment bond does the dentist have? Civil servant; Other.
6. Who is the dentist's employer? Local government direct contract; Other.
7. How long have the dentist been in the dental team? Two years or less; More than three years.
8. Does the dentist have career plan? Yes; No/do not know.
9. Does the career plan have progression for time of service? Yes; No/do not know.
10. Does the career plan have progression for professional performance? Yes; No/do not know.
11. Does the career plan have progression for titles and professional improvement? Yes; No/do not know.
12. Does the dentist receive financial incentive for good performance? Yes; No.
13. Does the dentist perform continuing professional development training? Score ranging from 0 to 8 according to the number of the listed activities performed.
Health work management of the dental team

1. Is the PHC unit a trainee field for undergraduate and graduate students? Yes; No.
2. Does the dental team have documents proving the monthly planning and scheduling of activities? Yes; No.
3. Does the dental team monitor and analyse population's oral health indicators? Yes; No.
4. Does the dental team receive support to plan and organise the labour process? Yes; No.
5. Does the dental team have access to data to analyse population's oral health status? Yes; No.
6. Does the dental team have documents proving self-evaluation in the past six months? Yes; No.
7. Does the dental team take part in the PHC team meetings? Always; Sometimes or never.
8. How is organised the dental appointment list? Flexible dental appointment list (scheduled and walk in patients); Restricted dental appointment list (scheduled patients only or walk in patients only).
9. When are the dental appointments scheduled? At any day and any time; At fixed days and hours.
10. Can the dental team refer the patients for secondary care? Yes; No.
11. How many PHC teams the dental team assist? (one PHC team cover about 3,500 patients) Score ranging from 1 to 9 according to the number of PHC teams.

Questions obtained from the external evaluation phase of PMAQ-AB programme, for the face-to-face interviews with the dental representative. PHC: primary health care.

Results

The data set comprised responses from 18,114 dental teams, with no missing data. Significant variation was observed across the different geographical regions. Regarding dentists' profiles (human resources factors), dental professionals in some regions were more likely to report additional training and involvement in academic activities. These regions also had more favorable labor conditions, including public sector employment, career progression opportunities, and financial incentives, compared to national averages. In contrast, regions with fewer such advantages reported lower frequencies of these factors. Concerning the "health work management" variables, regions with higher frequencies of activity monitoring and planning, as well as easier access to appointment scheduling and referrals, contrasted with those regions with less access to these resources.

On average, regions with more dental teams engaged in professional development training, such as those in the southeast, showed better performance in these areas, while regions in the north had fewer training opportunities. The southeast and south also had higher population coverage compared to other regions.

Initial simple linear regression and adjusted models were conducted for the entire country, using dental team performance as the dependent variable and the mentioned factors as independent variables. Variables with p-values ≤ 0.20 in the simple regression were included in the multiple regression model, using the "Stepwise Forward Method." Some variables, such as "master's degree/doctoral studies," "dentist's employer," and "career plan with professional advancement," were excluded in this process.

Upon checking for collinearity, the analysis revealed that the variables "employment bond" and "career plan" had high variance inflation factor (VIF) values (3.168 and 5.265, respectively), so these were removed from the model. After manual adjustments, all remaining variables had acceptable VIF values below 2.

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The findings indicated that having graduate studies, engaging in professional development training, mentoring students, being employed via public tender, and having a career plan linked to service time, professional performance, and financial rewards were associated with improved dental team performance. Moreover, work management-related variables, such as monitoring healthcare indicators and flexible scheduling, also positively impacted team performance.

Across all regions, "graduate studies" and "continuing professional development training" emerged as consistent factors influencing dental team performance. In the south, the dentists' profile had a stronger influence, especially regarding "graduate studies," "career plans linked to service time," and "financial performance incentives." In contrast, dental teams in the north were mainly influenced by "graduate studies," "continuing professional development training," and "employment bond (civil servant)."

The southeast region showed the highest number of work management-related variables that influenced dental team performance. These included "monitoring and analysis of healthcare indicators" and "flexible appointment scheduling," which were relevant across all regions.

The histogram and normal probability plot confirmed a normal distribution of residuals, and the model summaries indicated that the independent variables could explain about 22% of the variation in dental team performance. The adjusted R^2 values suggest that these results are representative of regional variations.

Discussion

The findings of this study highlight that having "graduate studies" (i.e., advanced educational qualifications) and engaging in continuing professional development were positively correlated with the performance of dental teams, both nationally and across different regions. Notably, regional disparities were evident, with the northern regions being influenced by fewer factors related to the dentists' profile, suggesting that disparities in care provision may exist when compared to other regions and the country as a whole.

A similar observation was made by Cunha et al. [12], who analyzed the same dataset and found that dentists who engaged in professional development were more likely to provide dental prostheses within primary health care (PHC) settings. Similarly, Baumgarten et al. [13] identified that management and dentist profile factors were linked to the effectiveness of five key primary care services, including restorations, extractions, scaling, planning, and pulpectomy [13]. While these studies corroborate the current findings, they focused on a limited range of dental procedures without assessing their psychometric validity. Given the significant role of dental professionals in delivering care through the national health system, this study offers crucial insights into how these factors influence dental team performance. It underscores the importance of adequate education and ongoing professional training to equip dental teams to meet the needs of the population [6].

The National Health System (SUS) recently marked its 30th anniversary, with global health policies from organizations like WHO [16] and the UK National Health Service (NHS), which has been operational for over seven decades, reinforcing the importance of primary health care (PHC) as a sustainable, cost-effective, and safe model for organizing health services [17, 18]. In this framework, the Family Health Strategy (FHS) is pivotal in delivering comprehensive health services, particularly to underserved populations. The FHS is designed to address 80% of health needs while coordinating care and providing essential referrals to specialized services [2].

one of the main strategies for enhancing the SUS workforce is the National Policy of Permanent Health Education, which aims to shift from a curative-focused model to one that aligns with the principles of SUS [19]. Santos and Hugo (2018) noted that dentists with specialized training in Family Health demonstrated more active engagement in core SUS activities, such as promoting oral health and conducting home visits [20].

While this study considered a broader range of specialization training beyond just Family Health, it supports previous findings that suggest specialized education can enhance the delivery of mandatory dental procedures and the core principles of SUS [20]. It is crucial that this type of training equips dentists with more comprehensive knowledge, improving patient care. However, such training should not restrict dental care to a narrow specialty but should rather enhance the overall quality of primary health services [6, 8].

Though specialized courses are typically available only to professionals who can afford them, the SUS offers a wide array of continuing education options. Notable among these are matrix support and telehealth services, which provide specialized technical assistance to PHC teams, thereby enhancing communication and integrating services. These initiatives contribute to improving the capacity of PHC teams to handle complex cases and address treatment-related queries [19, 20].

In a study exploring ways to strengthen PHC within SUS, Tasca et al. [17] emphasized the importance of strategic planning in workforce distribution, professional training, and sustainable career development for PHC staff [17]. This highlights the need for workforce training that is tailored to the local health system and population needs,

reinforcing the efficiency of SUS training programs [20]. Health policies and funding should support the professional development of staff to improve service quality.

The study also revealed that planning and organizing dental care services to meet local demands played a significant role in dental team performance. Factors such as "monitoring and analysis of population oral health indicators" and maintaining a "flexible dental appointment schedule" positively influenced performance across all regions, facilitating care for both scheduled and walk-in patients. These findings underscore the importance of evaluating and planning services to meet the unique needs of the population [21].

While scheduled appointments promote better service organization, the ability to accommodate walk-in patients addresses urgent health needs, particularly in underserved communities. This flexible approach helps mitigate social inequities, as individuals from lower socioeconomic backgrounds are more likely to seek emergency care [22]. However, the high demand for urgent care may reflect long waiting times or mismatched service hours, which can impede access for those working full-time [22, 23]. Referrals to secondary care, indicative of a well-organized care system, suggest the effective coordination within the SUS network, enhancing dental team performance [24].

Regional variations in the factors influencing dental team performance reflect the differing needs for dental care. This highlights the importance of understanding local health needs to ensure equitable care delivery. Furthermore, the findings suggest that some dental professionals may not have the capacity to meet all local demands, pointing to the need for additional training and support [10].

The independent variables examined in this study explained only about 22% of the variation in dental team performance. While this may seem modest, it remains significant in social sciences. To fully understand the complexities of a healthcare system and what drives team performance, further studies should explore other factors beyond dentists' profiles and work management. Additionally, the study's cross-sectional design limits its ability to establish causal relationships, suggesting the need for longitudinal studies.

Despite using secondary data from the second evaluation cycle of PMAQ-AB, which included nearly 80% of SUS dental teams in 2013-2014 and represented all five regions, this dataset provides valuable insights into the functioning of dental teams within primary care settings.

This study underscores the need for ongoing professional development to support dental teams in both individual and collective care planning. It also highlights the importance of local planning based on epidemiological data and the adaptation of services to meet regional needs, ensuring equitable care for both scheduled and walk-in patients. Addressing inequalities in regional care provision is essential for improving health outcomes. Future research should delve into additional factors influencing dental team performance, such as recruitment, deployment, and job security, which have been identified as significant in other countries and should be a focus of future studies [25]. Furthermore, exploring other variables outside dentists' profiles and health service organization could provide a more comprehensive understanding of the health system and its implications for primary dental care.

The results suggest that the quality of primary dental care is significantly influenced by the profile of the lead dentist, particularly those involved in advanced education and professional development. Additionally, effective work management in dental teams, especially in monitoring oral health indicators and offering flexible scheduling, is key to improving care delivery. The study emphasizes the regional variations in these factors and the importance of encouraging dentists to pursue further education, particularly in ways that enhance their ability to meet the needs of the national health system.

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