

Association between the development stage of the oral health care network and primary health care coverage in a state of southeastern Brazil

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Aim: The present study analyzed the association between the development stage of the oral health care network in a Brazilian state and oral health coverage of Primary Health Care (PHC).

Methods: A cross-sectional descriptive and analytical study was conducted with 205 municipal oral health coordinators of a state in the southeast of Brazil. Data collection was carried out through a validated questionnaire. Descriptive and cluster analysis were performed. Variables oral health coverage (total PHC and in the Family Health Strategy – FHS), allocation factor (AF) of financial resources, and expanded health area of municipalities were compared with the clusters ($p < 0.05$).

Results: Cluster 1 was classified as containing incipient health care networks ($n = 109$), and cluster 2 was classified as containing advanced health care networks ($n = 96$). Descriptive analysis showed that oral health coverage in total PHC was 100% and in FHS was 78.1%. The majority of municipalities were classified in quartiles AF 1 and 2. The expanded health areas with the highest number of municipalities were South and Southeast. Clusters were associated with total PHC coverage ($p = 0.038$) and FHS ($p = 0.009$), and no association between clusters with AF ($p = 0.754$) and expanded health area of municipalities ($p = 0.519$).

Conclusion: The municipalities' PHC coverage was related to the effectiveness of oral health network implantation.

Uniterms: Oral health. Health services. Integrality in health. Systems integration.

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INTRODUCTION

Health care networks are described as having structured interrelationships among institutions, services, and populations. It is a health system model that presents a polyarchical health service organization. The networks are characterized as a set of coordinated healthcare points, with horizontal and vertical relationships between these points of attention, which are coordinated by Primary Health Care (PHC)¹⁻⁴.

The main constituent elements of the healthcare network are the population, the

operational structure, and the care model^{2,3,5,6}. Several factors can influence the quality and effectiveness of the healthcare network, especially the financing of actions and services, as well as the organization of PHC^{1,4,7-10}.

The allocation factor (AF) of financial resources is an important tool used in Brazil to provide an equitable transfer of resources to municipalities, considering their health needs and their economic status. According to the literature, this is an index that expresses the municipality capacity to finance, with their own resources, the health care of its citizens^{4,7,11,12}. It was developed

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based on the association of two indexes: the Health Necessities Index (HNI) (an index that identifies priority areas for providing health care) and the Economic Status Index (ESI) (which corresponds to the per capita value of taxes on the movement of goods and services of each municipality (ICMS in Portuguese), worked by a logarithmic expression¹¹.

The AF creates an ordering of municipalities considering their health needs and their economic status with continuous values ranging from 1 to 2. Based on this order, the municipalities are then classified into 4 groups (quartiles). Group 1 is made up of municipalities that have less complex health needs, greater economic status and, consequently, a greater possibility to pay the health expenses of the population with their own financial resources. Consecutively, the municipalities classified as group 4 are those with greater health needs and lower economic status^{7,11,12}.

Regionalization considers the existence of municipalities that present different social and economic needs, with different territorial and population bases, and that need different forms of distribution and allocation of resources. This health plan instrument establishes a territorial and population basis in order to calculate the needs and prioritize the allocation of resources and decentralization. In summary, it enables the distribution and allocation of resources according to the social and economic needs of each municipality. With a better analysis of the social determinants of health in the way they are expressed in the territory, it is possible to guarantee the population's right to health and reduce inequalities^{4,12}.

In the oral health field, the PHC coverage can be classified as Oral Health Teams (OHT) of the Family Health Program (FHP) coverage and total coverage of PHC, where the family health teams and dentists work in the conventional model^{3,4,8,13-15}. Previous studies have stated that healthcare systems based on strong orientation towards PHC are more appropriate because they organize care according to the health needs of the population; they are more effective because it is the only way to deal with the situation of some chronic conditions; they are more efficient because they can present lower costs; and they show a higher quality because they place emphasis on health promotion^{2,4}.

The literature states that a better organization of services provided to the population can be achieved if improvements in the operational structure of health networks

and management training is performed^{9,14,16}. The study of some elements, such as AF, oral health coverage, an expanded health area of municipalities and their relation to the oral healthcare network function, can serve as a basis for discussion and contribution to enhance the monitoring and effectiveness of health care.

Thus, the hypothesis of the present study was that the coverage of primary health care in the municipalities was related to the effectiveness of the implantation of the oral health network. The aim was to analyze the association between the stage of development of the oral healthcare network and the oral health coverage of PHC in a state in southeastern Brazil.

MATERIAL AND METHODS

A cross-sectional descriptive and analytical study was carried out with the participation of municipal oral health coordinators in the state of Minas Gerais, Brazil. The state is located in the southeastern region of Brazil and is geographically divided into 13 macro-regions and 853 municipalities^{12,17}. At the time of data collection, the number of oral health coordinators was 570 and the number of dentists was 25,880¹⁸.

The sample size calculation for the study was based on the estimate of proportion for a finite population of 570. An expected frequency of 50.0% of participant satisfaction regarding the implementation of oral healthcare networks was taken as a reference. This percentage was used, taking into account that it would result in a larger sample size. An acceptable error of 5.5% and a confidence level of 95% were adopted. Hence 205 participants were needed. To minimize possible losses during data collection, which could compromise the representativeness of the sample, the sample size was increased by 20.0%. Therefore, 246 participants were required to assemble the sample. To ensure a representative sample of the municipal oral health coordinators of Minas Gerais, potential participants were selected using the simple random sampling technique. Municipalities that participated in the adaptation and validation phase of the instrument^{19,20}, or the pilot study were excluded. The random selection was carried out using the software Statistical Package for Social Science - SPSS[®], version 21.0 (IBM SPSS Statistics for Windows, Armonk, NY).

The municipal health coordinators of the selected municipalities received (via e-mail) through the technical reference organs of the Regional Health Superintendences/Managers

of the Minas Gerais Health Secretary, a free and informed consent form, and an instrument to evaluate the stage of development of the oral healthcare network^{19,20}. The e-mails of the participants were obtained through the technical reference organs (TR) of the 28 Regional Health Superintendence.

The instrument applied was composed of 107 questions distributed in seven domains: population, primary health care, secondary and tertiary healthcare points, support systems, logistic systems, network governance system, and healthcare model^{19,20}. The final result was obtained by adding together the scores from 0 to 3 obtained in each of the questions, giving a range between 0 and 321 points.

Through the result obtained, the network could then be classified in:

- Fragmented system: inability to operate healthcare networks (scores zero to 80:);
- Incipient healthcare networks: basic capacity to operate health care networks (scores 81 to 161);
- Advanced healthcare networks: Reasonably effective ability to operate healthcare networks (scores 162 to 241);
- Integrated healthcare networks: Optimal ability to operate health care networks (scores 242 to 321).

Before the main study began, a pilot study was performed with 10.0% of the municipalities of Minas Gerais to evaluate the research methodology and logistics.

Data was analyzed through the software SPSS[®] (version 20.0). First, a descriptive analysis was performed to characterize the municipalities' health network by calculating proportions. Then, cluster analysis was performed to group municipalities that showed similarities to the health network development structure. Cluster analysis is a multivariate hierarchical technique that organizes the observed data (in the present study, the scores of the network organization) into groups (clusters)²¹. The aim of the technique is to maximize the similarity of cases within each group and to maximize the difference between distinct groups.

Data about oral health coverage in PHC (total and FHS), AF (continuous and quartile), and the expanded health area of municipalities were obtained through the Oral Health Coordination of the State Health Secretariat of Minas Gerais (SES-MG in Portuguese).

Pearson's Chi-squared test and Fisher's exact test were used to compare the variables of FA and extended health region with the created clusters. The level of significance established

was $p < 0.05$. The variable oral health coverage in PHC (total and FHS) did not present normal distribution and was then compared to the cluster by applying the Mann-Whitney test.

The study was approved by SES-MG and by the Human Research Ethics Committee of the Federal University of Minas Gerais (UFMG) (protocol number 22642214.6.0000.5149).

RESULTS

The questionnaire was sent to 246 oral health coordinators. However, the final sample consisted of 205 participants. The losses were mainly related to incomplete completion of the questionnaire and/or inadequate responses. Considering this fact, during the sample size calculation, 20.0% was added; consequently, the losses were minimized and did not compromise the sample representativeness. The mean age was 37.8 (± 9.7) and the median was 38.0 years. The majority of the sample was female (61.4%). The mean value of time since completion of graduation was 158.3 months (± 109.6), with a median of 144 months (around 12 years since completion of graduation). In terms of educational level, 47% of the coordinators stated that they had completed a postgraduate course (specialization and/or professional master's degree). The mean time spent working as an oral health coordinator was 25.7 months (± 32.1) and the median time was 12 months.

The majority of municipalities were classified in quartiles 1 and 2 of the AF, corresponding to a lower need for economic resources. All municipalities (100%) presented a total coverage of PHC, and 160 municipalities were identified with oral health coverage in the FHS (78.1%).

Through sample analysis, three groups of clusters (two to four groups) were formed. The choice for two of the clusters was based on a better understanding of the phenomena²¹. Cluster 1 ($n = 109$) had a median score of 103 points, classifying it as containing incipient healthcare networks and reflecting a basic capacity to operate such networks. Cluster 2 ($n = 96$) had a median of 174.50 points, classifying it as containing advanced healthcare networks, with a reasonably effective capacity to operate such networks.

Table 1 describes the comparison between cluster 1 and 2 by expanded health area, AF, oral health coverage in PHC and FHS. The expanded health areas with the highest number of municipalities were South and Southeast.

Jequitinhonha and Triângulo do Sul areas were those with a lower number of municipalities. The municipalities distributed in cluster 1 and 2 did not differ significantly ($p = 0.519$) when the expanded health region was evaluated. The macro-regions of the Southeast (76.9%), Jequitinhonha (71.4%), South-Center (62.5%), South (61.1%), and Triângulo do Sul (60.0%) presented the largest number of municipalities in cluster 1. On the other hand, Southeast (64.0%), East (63.6%) and Triângulo do Norte (60.0%) macro-regions presented a greater number of municipalities in cluster 2. For the other macro-regions, the distribution of municipalities in cluster 1 or cluster 2 was very similar.

The municipalities distributed in cluster 1 and 2 did not differ in relation to AF. The median AF values in cluster 1 and 2 were, respectively,

1.35 and 1.37, with no statistically significant difference ($p = 0.959$).

Total oral health coverage in PHC presented a median of 100% in both clusters. There was a significant difference between the two clusters ($p = 0.038$), ranging from 65.57% to 100% in cluster 1 and from 83.43% to 100% in cluster 2.

There was a statistically significant difference between the clusters ($p = 0.009$) when oral health coverage in the FHS was evaluated. Cluster 1 presented a median of 69.3% of oral health coverage in the FHS and cluster 2 with a median of 82.7%. A posteriori power calculation was carried out for the variables of oral health coverage in PHC and FHS. For the 95% confidence interval (CI), the power values were 73% and 92%, respectively, for oral health coverage in PHC and FHS.

Table 1 - Comparison of clusters 1 and 2 according to the outcome's variables (n = 205)

Variables	Cluster 1 (n = 109) n (%)	Cluster 2 (n = 96) n (%)	p
Expanded Health Regions			
Central	10 (50.0)	10 (50.0)	0.519
Center-South	10 (62.5)	6 (37.5)	
Jequitinhonha	5 (71.4)	2 (28.6)	
East	4 (36.4)	7 (63.6)	
Southeast	10 (76.9)	3 (23.1)	
Northeast	6 (46.2)	7 (53.8)	
Northwest	7 (53.8)	6 (46.2)	
North	8 (47.1)	9 (52.9)	
West	11 (57.9)	8 (42.1)	
Southeast	9 (36.0)	16 (64.0)	
South	22 (61.1)	14 (38.9)	
Triângulo do Norte	4 (40.0)	6 (60.0)	
Triângulo do Sul	3 (60.0)	2 (40.0)	
Allocation Factor (AF)*			
Quartile 1	35 (54.7)	29 (45.3)	0.959
Quartile 2	28 (50.9)	27 (49.1)	
Quartile 3	19 (55.9)	15 (44.1)	
Quartile 4	27 (51.9)	25 (48.1)	

	Percentile 25-50-75	Percentile 25-50-75	
Oral health coverage in PHC	65.57-100-100	83.43-100-100	0.038
Oral health coverage in FHS	19.73-69.31-100	57.55-82.72-100	0.009

* Quartile 1: municipalities with < health needs, > economic status, and > possibility to pay the health expenses of the population with their own financial resources;

Quartile 4: municipalities with > health needs, < economic status, and < possibility to pay the health expenses of the population with their own financial resources.

DISCUSSION

In the present study, the association between the stage of development of the oral healthcare network and the coverage of oral health in primary care, in a state of Brazil, was analyzed. The hypothesis that the coverage of primary care in the municipalities was related to the effectiveness of the implantation of the oral health network was answered, since the municipalities with a health system classified as advanced healthcare networks (cluster 2) had a higher number of oral health coverages in PHC and FHS. This result corroborates with the literature, which points out that primary care is the coordinator of healthcare networks and that the organization of the work processes at this point of care, as well as its population coverage, impact the entire healthcare network². These results are important because they highlight the importance of oral health service coordinators focusing on the organization of the services in the perspective of a healthcare network. In this sense, the strengthening of PHC is essential in order to ensure that the health system responds resolutely to the needs of the population.

Effective funding of health actions and services and the organization of PHC may influence health coverage to the population^{1,7-10}. In this way, it is important to analyze the association between the development stage of the oral health care network in relation to the total oral health coverage in PHC, oral health coverage in FHS, AF of financial resources, and regionalization. The AF and regionalization can also contribute to a better quality of financing for the network, leading to the development of strategies that promote an effectiveness of health actions and services.

The AF classified the municipalities in ascending socioeconomic order, dividing the state into quartiles, with the same number of

municipalities in each quartile¹¹. It was possible to observe in the sample of the study that the majority of the municipalities presented a lower relative need for resources, as they were classified in quartiles 1 and 2. According Palmier et al.⁷, this can be explained by the fact that, although the municipalities of Minas Gerais present different socioeconomic difficulties, there is little variation in these difficulties, which makes the universe homogeneous.

Regionalization works as a tool to improve public services, which often goes beyond the municipal logic when the proposal is the implementation of healthcare networks^{4,9,14}. The results of the study pointed out that the expanded regions with the greatest number of municipalities were the South and Southeast. By contrast, the Jequitinhonha and Triângulo do Sul regions presented a smaller number of municipalities. This can be explained based on the fact that the South and Southeast regions concentrate a large number of municipalities of the state of Minas Gerais, most of which have a small territorial extension and greater proximity between them. Moreover, these regions together have the largest population of the state, with Belo Horizonte (state capital) presenting more than two million inhabitants^{7,12}.

However, the results showed no association in the comparison of municipalities distributed in clusters 1 and 2 with the AF and the expanded health region. This means that although the greater amount of financial resources represents better living and health conditions for society, it is possible to have places with higher social and economic conditions and less structured health systems^{4,10,11}.

In relation to PHC coverage, the 205 municipalities presented median oral health coverage of 100%, and a median of 78.1% for oral health coverage in the FHS. The literature shows that the expansion of the FHS has

structured the PHC model and strengthened healthcare networks, bringing a new form of planning health actions in the public sector^{9,14,22}. Nevertheless, national studies demonstrate that the processes of structuring and organizing PHC can vary among Brazilian municipalities and may well be related to the different contexts and forms of health management in the municipalities^{4,6,22,23}.

Health systems that present PHC actions and activities in a more resolute way minimize inequities and guarantee integral and quality health care. These systems tend to be more structured^{2,6,8,13,16,22,23}. It was observed that municipalities in cluster 2, which present a more structured network, when compared to cluster 1, presented lower variation in the total oral health coverage amplitude (cluster 1 – 18.6% to 100%/cluster 2 – 31.8% to 100%). Cluster 2 also presented a higher oral health coverage in the FHS (82.7%). Both had a statistically significant difference.

It was observed that more than half of the municipalities evaluated in the present study were classified in Cluster 1, as containing incipient implementation and organization of healthcare networks. These results showed that it is necessary to enhance the qualification of the networks in the state. It also corroborates with previous studies, which have highlighted that the peculiarities existing among different regions, such as population distribution, demographic density, and socioeconomic status, may have an influence in the structuring of services^{12,24}.

In addition, social and economic inequalities have a significant influence on health organization, regardless of the country's financial income^{14,25}. Thus, it is important to emphasize the role of the Brazilian Unified Health System (UHS or SUS, for its Portuguese acronym) and healthcare networks in reducing these inequalities and in promoting universal access to health care^{1,4,9,15,26}.

Another point that should be taken into account refers to the fact that the municipalities surveyed in the present study were at different stages of the implementation of the oral healthcare network. According to Lavras²³ and Godoi et al.²⁷, this finding may reflect a service that is unable to adequately respond to the demands placed by the health needs framework, characterizing a health network with fragmented services, regardless of the AF (socioeconomic status) and the region in which the municipality is classified.

Some limitations of the present study should be acknowledged. First, obtaining data through questionnaires, which may generate

an information bias, may not represent the real situation of the oral healthcare network in some municipalities. Second, there was a sample loss of 20%, and despite occurring at the limit and not compromising the sample representativeness, it should be highlighted. This occurred due to an incomplete completion of the questionnaire and/or inadequate responses.

Organizing oral health services from the perspective of a healthcare network favors the effectiveness of health actions and services. To guarantee effectiveness of oral healthcare networks, it is essential that services be organized according to population needs. This should be done through the qualification of operational structure, mainly in PHC, taking into account the socioeconomic and regional differences of the municipalities.

CONCLUSION

The results presented in this study showed that the total oral health coverage in PHC and FHS were associated with the quality of the network, as municipalities classified as having a more developed stage in the oral healthcare network have better PHC and FHS coverage. Organizing PHC in oral health, from the perspective of a healthcare network, contributes to the effectiveness of health actions and services.

CONFLICT OF INTEREST

The authors declare no conflict of interest.


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Associação entre o estágio de desenvolvimento da rede de atenção à saúde bucal e a cobertura da atenção primária em um estado do Sudeste do Brasil

Objetivo: O presente estudo analisou a associação entre o estágio de desenvolvimento da rede de saúde bucal em um estado brasileiro e a cobertura em saúde bucal da Atenção Primária à Saúde (APS).

Métodos: Foi realizado um estudo descritivo e analítico de corte transversal com 205 coordenadores municipais de saúde bucal de um estado do sudeste do Brasil. A coleta de dados foi realizada através de um questionário validado. Foram realizadas análises descritivas e de cluster. As variáveis cobertura da saúde bucal (APS total e na Estratégia Saúde da Família-ESF), fator de alocação (FA) de recursos financeiros e área ampliada de saúde dos municípios foram comparadas com os cluster ($p < 0,05$).

Resultados: O cluster 1 foi classificado como apresentando redes de assistência à saúde incipientes ($n = 109$) e o cluster 2 foi classificado como apresentando redes de assistência à saúde avançadas ($n = 96$). A análise descritiva mostrou que a cobertura de saúde bucal total na APS foi de 100% e na ESF foi de 78,1%. A maioria dos municípios foi classificada nos quartis FA 1 e 2. As áreas de saúde expandidas com maior número de municípios foram Sul e Sudeste. Os clusters foram associados à cobertura total da APS ($p = 0,038$) e ESF ($p = 0,009$); e não houve associação entre clusters com FA ($p = 0,754$) e área ampliada de saúde dos municípios ($p = 0,519$).

Conclusão: A cobertura da APS dos municípios esteve relacionada à efetividade da implantação da rede de saúde bucal.

Descritores: Saúde bucal; Serviços de saúde; Integralidade em Saúde; Integração de Sistemas.