Access to Dental Services among Hypertensive Elderly in Peru: Exploring Patterns and Implications

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Abstract: *Background*: This study was conducted to determine access to dental services in the elderly with hypertension in Peru.

Methods: Observational, analytical, and cross-sectional design. Data used for analysis in this research was collected from the Demographic and Family Health Survey of Peru (ENDES) from 2019 to 2021.

Results: A Poisson regression analysis was performed a weighted sample for calculating prevalence ratio (PR) with their 95% confidence intervals (95%CI). The multiple regression analysis did not find among the factors associated with the probability of using the dental health service, since neither the time less than two years of hypertension (PR=0.74, 95%CI 0.53 – 1.02); nor from 2 to 4 years (PR = 0.97, CI 95% 0.86 – 1.09); neither a time of hypertension from 5 years or more (PR = 0.94, CI 95% 0.85 – 1.03) were associated.

Conclusion: The study concluded that hypertensive patient over 60 years of age, despite a previous diagnosis of hypertension or not, does not attend dental service, reflecting a lack of interest and a greater risk exposure to cardiovascular complications associated with oral health.

INTRODUCTION

Hypertension (HTN) is a chronic degenerative disease defined by having a figure greater than or equal to 140 mmHg in systolic pressure and greater than 90 in diastolic pressure. This disease is usually asymptomatic until it is well established in the body, however, its detection is diagnostic and treatment [1].

Worldwide, its figures increase after 50 years of age, more than 13 million people suffer from it and 8 million have not been diagnosed [2]. In Peru, approximately 5.5 million people over the age of 15 have hypertension [3].

In recent years, studies have been carried out on the relationship between arterial hypertension and oral health; observing a close relationship between the two [4]. On the other hand, it was observed in a study that approximately 7.5% of the hypertensive population attend dental consultation, being a great public health concern worldwide where greater emphasis should be placed because its complications can threaten life, can be prevented by not performing dental treatment in patients with severe hypertension, but before that the important thing is that the doctor confirm the diagnosis of arterial hypertension and follow a previous treatment [5].

Even though it is known that the presence of HTN leads to various complications, including worsening oral health, there is no adequate compliance with oral health control by patients. Due to the little evidence that relates to HTN and oral health is scarce regarding whether going to the dentist varies according to the time of illness of the patient, the objective of the present study is to determine the access to dental services in elderly with hypertension in Peru.

2. METHODS

2.1. Study Design

The present study had an observational, analytical and cross-sectional design. Data used for analysis in this research was collected from the Demographic and Family Health Survey of Peru (ENDES) from 2019 to 2021 [6].

2.2. Recruitment and Data Collection

The population is elderly Peruvian residents located across the country during the census period (2019-2021). The sample was retrieved from statistical information from country level censuses. The sampling method was balanced, stratified and independent probabilistic two-stages, at the province level including urban and rural areas. For this research, the results from the Demographic and Family Health Survey of Peru (ENDES) from 2019 to 2021 were used for data analysis – considering male and female participants

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who fit the study criteria. The criteria used in this research were people aged 60 years or older diagnosed with or not with hypertension who fully answered the oral health and hypertension modules. The exclusion criteria comprised participants who did not answer the oral health or hypertension module.

2.3. Variable

2.3.1. Response Variable

The response variable was access to dental services. This was evaluated through the census question: "How long ago was the last care", it was categorized in months (if < 2 years), years (if 2 or more years), don't know/don't remember", it was categorized as yes, no, don't know/don't remember.

2.3.2. Exposure Variables

Other variables used in the analysis were:

1. Sex: male or female,

2. Age: 60 to 74 years, 75 to 90 years, 91 to 100 years,

3. Province or Region of residence: Lima – metropolitan area, also Coast, Highlands, and Jungle of Peru,

4. Level of Education: unschooled, Elementary, Secondary or High School, Post-Secondary,

5. Wealth index: poorest, poor, average, wealthy, wealthiest.

6. Type of residence urban or rural area,

7. History of arterial hypertension (time): No presentation, up to 1 year, 2 to 4 years, 5 years to more.

8. Physical disability: Yes or No

Trained personnel by ENDES was in charge to survey a pool of residents at their homes to collect information for the Census, between February and December from 2019 to 2021. The method applied was one-on-one interviews.

2.4. Procedures

The participants in the Household questionnaire self-identified as Head of Household, Spouse, or Household member aged 18 or over. Participants in the Individual questionnaire self-identified as people aged

60 and over. The main variables for this research were the questions about Oral health (QS311) and hypertension (QS103C) [6].

2.5. Statistical Analysis

Statistical analysis was performed with STATA v17 software. Microsoft Office was used in the development of this research study: Excel sheets to synthesize data insights and elaborate charts, and Microsoft Word to analyze results and present findings. For univariate analysis, the information was organized to calculate frequencies and percentages for each variable. In addition, a bivariate analysis was done using the Rao-Scott Chi-square test for categorical variables. Poisson regression with robust variance was used on multivariate analysis where the raw and adjusted prevalence ratios (PR) were calculated with a level of 95% confidence intervals (95% CI). We opted to employ robust Poisson regression for computing prevalence ratios due to its applicability and efficiency, particularly when the log-binomial model fails to converge a challenge we encountered in our own analyses. This approach is substantiated by a wealth of studies that affirm its efficacy in estimating prevalence ratios [7, 8].

The formula of the regression analysis was:

$\log(E[\text{Dental Care} | X]) = \beta0 + \beta1 \text{ (Sex)} + \beta2 \text{ (Categorized age)} + \beta3 \text{ (Region)} + \beta4 \text{ (Educational level)} + \beta5 \text{ (Wealth index)} + \beta6 \text{ (Civil status)} + \beta7 \text{ (Diabetes)} + \beta8 \text{ (Nutricional condition)} + \beta9 \text{ (Time with HTN)}$

2.6. Ethical Considerations

Data was retrieved from the ENDES Census. The interviewers informed each participant about the important details from the consent forms, and proceed to collect data from participants who agreed to be part of the study. Personal information is not collected in this survey, to guarantee the confidentiality of each of participant.

3. RESULTS

The inclusion and exclusion criteria were applied to the total number of participants in the ENDES survey, in order to calculate the sample of study. The sample included 22235 Peruvian residents in this research.

Male participants represented 51.15% of the sample. Regarding age, the highest percentage of participants were people between 60 and 69 years (57.47%), and only 9.18% from this population lived in

the Jungle region. Unschooled participants were only 0.81%. On the other hand, more than a thousand participants had a highest index of wealth – almost 26.96% of the study population. Regarding marital status, 46.31% were married. The prevalence of diabetes was 9.47% and the overweight was 40.41%. Only 10 278 people from this study did not have access to dental services (Table **1**).

Table 1: General Characteristics of the ENDES Study Population, 2019 to 2021

Characteristics	n (% Wighted)
Sex	
Female	10 861 (48.85)
Male	11 374 (51.15)
Categorized age	
60 to 69 years old	12 779 (57.47)
70 years to more	9 456 (42.53)
Region	
Lima-metropolitan area	8 407 (37.81)
Coast	5 489 (24.69)
Highlands	6 278 (28.32)
Jungle	2 041 (9.18)
Educational level	
Without education	160 (0.81)
Primary	8 551 (43.37)
Secondary	5 955 (30.22)
Post-Secondary	5 051 (25.62)
Wealth index	
Poorest	4 257 (19.14)
Poor	3 436 (15.45)
Average	3 690 (16.60)
Wealthy	4 856 (21.84)
Wealthiest	5 996 (26.96)
Civil status	
Single	1 221 (5.49)
Married	10 298 (46.31)
Cohabiting	2 355 (10.59)
Widowed	5 312 (23.89)
Divorcee	429 (1.93)
Separated	2 620 (11.78)
Diabetes	
No	20 108 (90.53)
Yes	2 104 (9.47)
Nutricional condition	
Normal weight	7 516 (35.02)
Overweight	8 674 (40.41)
Obesity	5 275 (24.57)
Time with HTN	
Doesn't have htn	19 475 (87.58)
Less tan 2 years	97 (0.44)
From 2 to 4 years	814 (3.66)
From 5 or more	1 850 (8.32)
Dental care (< 2 años)	
No	10 278 (46.23)
Yes	11 957 (53.77)

Source: own elaboration.

Table **2** shows a bivariate analysis was used in all characteristics of interest. Of all the variables studied, those that did not present a statistically significant association were sex (p=0.174), education (p=0.680), marital status (p=0.199), diabetes (p=0.071) and time with htn (p=149). The rest of the variables presented a statistically significant association with respect to dental care in <2 years (p < 0,001).

In Table **3**, a Poisson regression analysis was performed a weight sample. The multivariable regression analysis did not find among the factors associated with the probability of using the dental health service, since neither the time less than two years of htn (PR=0.74, CI 95% 0.53 – 1.02); nor from 2 to 4 years (PR = 0.97, CI 95% 0.86 – 1.09); neither a time of htn from 5 years or more (PR = 0.94, CI 95% 0.85 – 1.03) were associated.

4. DISCUSSION

The results of the present study indicate that, despite the long lifespan, people above 60 years old, whether diagnosed with htn or not (regardless of the duration of the illnes), do not access to dental services.

According to not presenting HTN, in our study did not found an association between presenting htn and seeking dental services. Contrary to our study, Ordoñez *et al*. [9] observed that 29% of patients with hypertension (diagnosed or not), represented a higher proportion than expected in attending a dental consultation. In addition, in the study realized by Vásquez *et al*. [10], it was found that the majority of people attended in urgency presented hypertensive emergency with arterial pressures equal to or greater than 180/120 mmHg.

According to the diagnosis time of htn up to 1 year, no association was found between the first year of htn diagnosis and attending dental services. In the same way, according to Meneses *et al*. [11], among his findings, it was observed that among patients who attended dental service, 33% of males in their clinical examination showed values related to htn but only 13% reported their official diagnosis before consult whereas 25% of females showed values related to htn but only 15% reported their previous diagnosis.

According to the diagnosis time of htn from 2 to 4 years, there was no association between the diagnosis time from 2 to 4 years of htn and seeking dental service. Contrary to our study, as stated by Jinkwon

Table 2: Bivariate Analysis of Association between Variables of Interest from ENDES Survey Population and People who had Dental Care <2 Years, from 2019 to 2021

Characteristics	Dental care (< 2 años)		p*
	No	**Yes**	
	n (%)	**n (%)**	
Sexo			
Female	5 112 (47.06)	5 749 (52.94)	0.174
Male	5 167 (45.43)	6 207 (54.57)	
Categorized age			
60 to 69 years old	6 279 (49.13)	6 500 (50.87)	**< 0.001**
70 years to more	4 000 (42.30)	5 456 (57.70)	
Natural region			
Lima-metropolitan area	4 498 (53.51)	3 908 (46.49)	**< 0.001**
Coast	2 420 (44.09)	3 069 (55.91)	
Highlands	2 614 (41.51)	3 683 (58.49)	
Jungle	746 (36.54)	1 295 (63.46)	
Educational level			
Without education	67 (41.92)	93 (58.08)	0.680
Primary	3 334 (38.99)	5 217 (61.01)	
Secondary	2 864 (48.09)	3 091 (51.91)	
Post-Secondary	3 095 (61.28)	1 956 (38.72)	
Wealth index			
Poorest	1 447 (33.99)	2 810 (66.01)	**< 0.001**
Poor	1 280 (37.25)	2 156 (52.75)	
Average	1 528 (41.66)	2 153 (58.34)	
Wealthy	2 286 (47.08)	2 569 (52.92)	
Wealthiest	3 728 (62.18)	2 268 (37.82)	
Estado civil			
Single	549 (44.96)	672 (55.04)	0.199
Married	4 989 (48.44)	5 309 (51.56)	
Cohabiting	1 024 (43.49)	1 331 (56.51)	
Widowed	2 201 (41.43)	3 111 (58.57)	
Divorcee	285 (66.41)	144 (33.59)	
Separated	1 231 (46.99)	1 389 (53.01)	
Diabetes			
No	9 221 (45.86)	10 886 (54.14)	0.071
Yes	1 051 (49.96)	1 053 (50.04)	
Nutritional condition			
Normal weight	3 163 (42.08)	4 354 (57.92)	**< 0.001**
Overweight	4 189 (48.30)	4 484 (51.70)	
Obesity	2 617 (49.62)	2 657 (50.38)	
Time with htn			
Doesn't have htn	8 904 (45.72)	10 571 (54.28)	0.149
Less tan 2 years	55 (53.83)	42 (43.17)	
From 2 to 4 years	377 (46.25)	438 (53.75)	
From 5 or more	943 (50.98)	907 (49.02)	

Source: own elaboration.

Table 3: **Crude Poisson Regression Analysis Adjusted for Time with Hypertension.**

Characteristics	Crude Analysis			Adjusted Analysis*		
	PRc	CI 95%	p	PRa	CI 95%	p
Time with htn						
Doesn't have htn	Ref.			Ref.		
Less tan 2 years	0.88	0.58 - 1.09	0.149	0.74	0.53 - 1.02	0.065
From 2 to 4 years	0.99	0.89 - 1.10	0.859	0.97	0.86 - 1.09	0.555
From 5 or more	0.90	0.83 - 0.99	0.026	0.94	0.85 - 1.03	0.173

Source: own elaboration.

et al. [12], among the population who had been diagnosed with hypertension and received complete oral health check-ups, it was observed that more than 50% presented cavities, putting them at a higher risk of developing cardiovascular diseases such as stroke. Furthermore, according to Iwashima *et al.* [13] found a relationship between oral health markers and the risk of htn in a population without previous cardiovascular disease

Regarding the duration of HTN of 5 years or more, no association was found between the diagnosis of HTN for 5 years or more and attending dental service. In the same way, according to Park *et al.* [14], there was no association between the duration of the diagnosis of hypertension and seeking dental service. Nevertheless, he added that the risk of cardiovascular events was higher in subjects with periodontal disease, a greater number of cavities, or more tooth loss. In addition, according to Muñoz *et al.* [15] the more severe the periodontitis, the higher the possibility of having HTN compared to patients without periodontitis. This may be due to the lack of dental check-ups in hypertensive patients. Additionally, according to Czesnikiewics *et al.* [16], it was observed an association between periodontitis and htn, and the improvement in periodontal state after dental treatment, such as intensive periodontal therapy, was related to the improvement in the 24-hour blood pressure profile.

This investigation presents strengths and limitations. Firstly, due to being a cross-sectional study, its causality cannot be determined; it can be the First scope of the behavior of these variables for the access to dental service. Secondly, this study is a secondary analysis of the ENDES database that was collected for another purpose, for this reason, future studies must confirm the results found and conduct primary data collection, including in-depth interviews, to explore the barriers to accessing these services.

5. CONCLUSION

In summary, our study reveals a pressing public health issue: patients over the age of 60 with hypertension, irrespective of whether they have been previously diagnosed, exhibit low utilization of dental services. This lack of engagement suggests not only a disinterest in oral healthcare but also elevates their risk for cardiovascular complications, which are often interlinked with poor oral health. Given the aging population and the rising prevalence of hypertension, these findings necessitate an immediate reevaluation of existing intervention strategies.

Our results indicate that healthcare policies must be more inclusive and targeted to encourage this high-risk group to access dental care. Public health initiatives should focus on disseminating the information regarding the cardiovascular risks associated with poor oral hygiene, especially among hypertensive older adults. Further research is needed to confirm these results, but if corroborated, they could serve as the basis for more effective, evidence-based strategies that promote increased access to dental services for these individuals and their communities, thereby mitigating associated health risks.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORSHIP CONTRIBUTIONS

The authors participated in the genesis of the idea, project design, data collection and interpretation, analysis of results, and preparation of the manuscript of this research paper.

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REFERENCES

[1]   La OMS revela las principales causas de muerte y discapacidad en el mundo: 2000-2019 [Internet]. [citado el 21 de febrero de 2023]. Disponible en: https://www.who.int/es/news/item/09-12-2020-who-reveals-leading-causes-of-death-and-disability-worldwide-2000-2019

[2]   Estados Unidos Mexicanos. Modificación a la Norma Oficial Mexicana NOM-030-SSA2-1999, Para la prevención, tratamiento y control de la hipertensión arterial, para quedar como Norma Oficial Mexicana NOM-030-SSA2-2009, Para la prevención, detección, diagnóstico, tratamiento y control de la hipertensión arterial sistémica. [Internet]. Disponible en: https://dof.gob.mx/nota_detalle_popup.php?codigo=5144642

[3]   Medina Lezama J, Chirinos Medina J, Zea Díaz H, Morey Vargas O, Bolaños Salazar J, Cuba Bustinza C, Corrales Medina F, Valdivia Ascuña Z, Chirinos Pacheco J. Aspectos epidemiológicos y hemodinámicos de la hipertensión y de la prehipertensión arterial en Arequipa. Resultados del estudio prevención. Rev peru cardiol (Lima) 2009; 35(1): 30-43. Disponible en: https://pesquisa.bvsalud.org/portal/resource/pt/lil-661380

[4]   Brodeur JM, Payette M, Beniger M, Charbonneau A, Olivier M, Chabot D. Periodontal diseases among Quebec adults aged 35 to 44 years. J Can Dent Assoc 2001; 67(1): 34. Disponible en: https://pubmed.ncbi.nlm.nih.gov/11177219/

[5]   Díaz NA, Rodríguez MÁV. Manifestaciones bucales en pacientes hipertensos bajo tratamiento antihipertensivo. Arch Inv Mat Inf 2009; 1(2): 90-4. Disponible en: https://www.medigraphic.com/cgi-bin/new/resumen.cgi?IDARTICULO=22830

[6]   Instituo Nacional de Estadistica e Informatica. Microdatos base de datos [Internet]. [citado el 27 de febrero de 2023]. Disponible en: https://proyectos.inei.gob.pe/microdatos/

[7]   Zou G. A modified poisson regression approach to prospective studies with binary data. Am J Epidemiol 2004; 159(7): 702-6. https://doi.org/10.1093/aje/kwh090

[8]   Barros AJ, Hirakata VN. Alternatives for logistic regression in cross-sectional studies: an empirical comparison of models that directly estimate the prevalence ratio. BMC Medical Research Methodology 2003; 3(1): 21. https://doi.org/10.1186/1471-2288-3-21

[9]   Daza DEO, Sinisterra GAS. Hipertensión arterial en pacientes de un servicio de atención prioritaria de odontología y su relación con características sociodemográficas. Acta Odontológica Colombiana [Internet] 2020 [citado el 6 de abril de 2023]; 10(2): 39-51. https://doi.org/10.15446/aoc.v10n2.83721

[10]   Terrail JAV de PD, Secchi A, Moreno J, Amorin P, Astorga F. Epidemiología de las atenciones dentales de urgencia atendidas en el Hospital Barros Luco Trudeau. Rev Odont Mex [Internet]. 2022 [citado el 6 de abril de 2023]; 25(1): 45-53. https://doi.org/10.22201/fo.1870199xp.2021.25.1.82270

[11]   Ordoñez D, Sinisterra G. Caracterización de los pacientes que asisten a consulta a la Clínica de Ingreso de pacientes, Diagnóstico y Urgencias (CIDU) en la escuela de odontología de la universidad del valle durante el año 2011. Rev Estomat Salud 2012; 20(2): 24-28. LILACS, COLNAL; ID: biblio-875644. CO624.9.

[12]   Kim J, Kim HJ, Jeon J, Song T-J. Association between oral health and cardiovascular outcomes in patients with hypertension: a nationwide cohort study. J Hypertens 2022; 40(2): 374-81. https://doi.org/10.1097/HJH.0000000000003022

[13]   Iwashima Y, Kokubo Y, Ono T, Yoshimuta Y, Kida M, Kosaka T, *et al*. Additive interaction of oral health disorders on risk of hypertension in a Japanese urban population: the Suita Study. Am J Hypertens 2014; 27(5): 710-9. https://doi.org/10.1093/ajh/hpt227

[14]   Park S-Y, Kim S-H, Kang S-H, Yoon C-H, Lee H-J, Yun P-Y, *et al*. Improved oral hygiene care attenuates the cardiovascular risk of oral health disease: a population-based study from Korea. Eur Heart J 2019; 40(14): 1138-45. https://doi.org/10.1093/eurheartj/ehy836

[15]   Muñoz Aguilera E, Suvan J, Buti J, Czesnikiewicz-Guzik M, Barbosa Ribeiro A, Orlandi M, *et al*. Periodontitis is associated with hypertension: a systematic review and meta-analysis. Cardiovasc Res 2020; 116(1): 28-39. https://doi.org/10.1093/cvr/cvz201

[16]   Czesnikiewicz-Guzik M, Osmenda G, Siedlinski M, Nosalski R, Pelka P, Nowakowski D, *et al*. Causal association between periodontitis and hypertension: evidence from Mendelian randomization and a randomized controlled trial of non-surgical periodontal therapy. European Heart Journal 2019; 40(42): 3459-70. https://doi.org/10.1093/eurheartj/ehz646