Oral Health - Factors of Non-Adherence to Dental Vouchers: A Case-Control Study

Saúde Oral - Fatores de Não Adesão aos Cheques-Dentista: Um Estudo de Caso-Controlo

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Acta Med Port 2018 Jun;31(6):303-311 ▪ https://doi.org/10.20344/amp.9640

ABSTRACT

Introduction: A dental voucher was created to facilitate the access to oral health care, however the use of these vouchers, by students aged 7, 10 and 13 with dental caries from state schools within the geodemographic area covered by the Community Health Center Group of Western Lisbon and Oeiras, had a low uptake (23%, school year 2014/2015) The aim of this study was to examine the factors associated with this non-use.

Material and Methods: A case-control study was carried out involving 270 students (135 cases and 135 controls) from 35 state schools who agreed to participate in the study. A descriptive analysis of the reasons for non-adhesion to the voucher, and a study associating the variables and the use/non-use of the dental vouchers using bivariate and multivariate statistical analysis was made adopting a significance of 0.05.

Results: The main reasons for non-use (n = 135) were the use of private dentists outside the dental voucher scheme (23.7%) and forgetting to use the vouchers or exceeding the expiry date (21.5%). The main factor associated with the non-use was students having a private dentist (OR adjusted 2.004, p = 0.012; IC 95%: 1.176 – 3.413) and the main factor associated with the use was having information of dentists accepting dental vouchers (OR adjusted 0.096, p = < 0.001; IC 95%: 0.047 – 0.198).

Discussion: Our findings highlight the need to improve the accessibility to dental vouchers.

Conclusion: It is hoped that the identification of these factors will contribute in the planning of strategies and activities to improve the use of dental vouchers.

Keywords: Health Education, Dental; Health Promotion; Oral Health; Portugal; Program Evaluation

RESUMO

Introdução: O cheque-dentista foi criado para efetivar o acesso às consultas de medicina dentária, no entanto, a utilização dos primeiros cheques-dentistas pelos alunos com cáries de 7, 10 e 13 anos das escolas públicas da área geodemográfica do Agrupamento de Centros de Saúde Lisboa Ocidental e Oeiras (ACES LOO) tem sido baixa (23%, ano letivo 2014/2015). Com este trabalho, pretendemos estudar os fatores associados à não utilização.

Material e Métodos: Realizámos um estudo caso-controlo que envolveu 270 alunos (135 casos e 135 controlos), provenientes das 35 escolas públicas que aceitaram participar no estudo. Foi feita uma análise descritiva dos motivos da não adesão e a pesquisa da associação entre as variáveis e a utilização/não utilização do cheque-dentista por análise estatística bivariável e multivariável, adotando-se um nível de significância de 0,05.

Resultados: Os principais motivos para a não utilização elencados (n = 135) foram ter dentista particular não aderente ao cheque-dentista (23,7%) e ter-se esquecido de utilizar o cheque-dentista, deixando ultrapassar o prazo de validade (21,5%). O principal fator associado à não utilização foi o aluno ser vigiado por dentista particular (OR ajustado 2,004, p = 0,017; IC 95%: 1,176 - 3,413) e o principal fator associado à utilização foi o encarregado de educação ter conhecimento de dentista aderente ao cheque-dentista (OR ajustado 0,096, p < 0,001; IC 95%: 0,047 - 0,198).

Discussão: Os resultados obtidos realçam a necessidade de se melhorar a acessibilidade aos cheques-dentista.

Conclusão: Espera-se que a identificação destes fatores possa contribuir para planear estratégias e atividades com vista a aumentar a utilização dos cheques-dentista.

Palavras-chave: Avaliação de Programas e Projetos de Saúde; Educação em Saúde Oral; Portugal; Promoção da Saúde; Saúde Oral

INTRODUCTION

A total of 3.9 billion people were affected by oral diseases in 2010, with the loss of 15 million disability-adjusted life years (DALY) worldwide, according to the 2010 *Global Burden of Disease* study.[1] In addition, high healthcare costs were related to these diseases, which have been considered by the World Health Organization (WHO) as the fourth most expensive diseases to treat.[2] An estimated 79 billion euro spending has been reported in the European Union in 2012.[3]

Dental caries (tooth decay) is the most prevalent chronic disease worldwide[1] and, despite its global decline, remains as an important concern in public health and 60-90% of school aged children as well as most adult people have been affected, due to its cumulative characteristics, leading to millions of work days.[2]

An estimated prevalence of at least 80% of caries-free children under the age of 6 is expected by 2020, according to the European strategy and the targets defined by the WHO for oral healthcare.[4] In Portugal, despite a decline in dental caries prevalence, according to the 2015 *III Estudo*

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Recebido: 03 de setembro de 2017 - Aceite: 02 de maio de 2018

Nacional de Prevalência das Doenças Orais, only 55% of the Portuguese 6 year old were caries free, declining to 32.4% in people aged 18.[5]

Tooth decay is highly vulnerable when adequately prevented and early treated, involving low economic costs and relevant health gains.[4] Preventive dental interventions including early routine care, fluoride and sealants are cost-effective, as shown in literature, even though the access to dental preventive healthcare is strongly affected by the lack of an effective healthcare policy.[3]

In Portugal, dental health has been one of the areas where public coverage of the needs for healthcare has been less effective.[6] According to the 2011 *European Union Statistics on Income and Living Conditions* (EU-SIL) survey, Portugal was among the three European countries with the highest uncovered needs for dental examination (14.5%) and high costs being the main reason for not attending the dentist.[7]

The National Programme for Oral Health Promotion [*Programa Nacional de Promoção de Saúde Oral (PNPSO)*][6] has been introduced in 2005 aimed at filling this gap and, in order to make the access to dental medicine more effective, a dental care voucher programme has been developed in 2008.[8]

Children and adolescents (aged 7, 10 and 13) are the major target, corresponding to 85% of the whole dental vouchers that were issued.[6] Up to two dental vouchers per school term could have been issued to children aged 7 and 10 and up to three to children aged 13, with a maximum value of 35 euro per voucher.[9]

Oral health team within the Public Health Unit (*Unidade de Saúde Pública*) had the mission of undertaking a dental screening in public schools: a dental voucher was issued whenever a child presented with caries in permanent teeth and, in case of no caries, a document allowing for the attendance to oral hygiene treatment was issued.[10] A national participation rate of only 64% has been found,[6] despite the increasing number of first dental vouchers used by patients from 2009 to 2013 (188,263 to 312,394).[11]

A total of 233,465 people are covered by the *Agrupamento de Centros de Saúde Lisboa Ocidental e Oeiras (ACES LOO)* – Western Lisbon and Oeiras Healthcare Centre Group,[12] a mostly urban area with a population density and a dependence rate of young and elderly people above those found in the *Administração Regional de Saúde de Lisboa e Vale do Tejo (ARS LVT)* - Regional Health Administration of Lisbon, as well as a higher level of education and purchasing power and a lower unemployment rate.[13] The ACES LOO is inserted into the ARS LVT, which was the Regional Health Administration with the lowest ratio of participating dentists.[6] A low uptake (23% in the 2014/2015 term) has been found in the ACES LOO.[14]

Factors as education, social and economic level as well as caregivers' literacy, access to information and resources and access to dental healthcare have a critical influence on children and young people's dental health, as shown by literature.[15]

This study aimed at knowing the factors that were related to failure to use the first dental voucher by students attending the public schools in the area covered by the ACES LOO in 2014/2015 term and aged 7, 10 and 13, considering that dental vouchers were free-of-charge and aimed at oral healthcare needs that were previously identified.

This was a case-control study including the following variables: social and demographic characteristics of caregivers (age, gender, degree of kinship, marital status, education, occupation, occupational status and, whenever applicable, reason for inactivity), social and demographic characteristics of young students (age, gender, school where initial enrolment took place) and the analysis of variables regarding the *PNPSO* (dental voucher receiver, information on the participating dentists, follow up by a private dentist and, in such a case, whether or not a participating dentist).

MATERIAL AND METHODS

A retrospective case-control observational and epidemiological study has been carried out, aimed at young students aged 7, 10 and 13 attending public schools within the area of the ACES LOO and having been entitled to the first dental voucher throughout the 2014/2015 term (total of eligible students: 2,496). Young students aged 7, 10 or 13 attending a public school within the area covered by the ACES LOO, having been issued the first dental voucher and having not used it throughout the 2014/2015 term were included in the case group and students aged 7, 10 or 13 attending a public school within the area covered by the ACES LOO, having been issued the first dental voucher and having used it within the 2014/2015 term were included in the control group.

The following inclusion criteria were considered: children aged 7, 10 or 13 by the 2014/2015 term, attending public schools within the area covered by the ACES LOO throughout the 2014/2015 term, having been issued the first dental voucher throughout the 2014/2015 term and with an informed consent by caregivers for the participation in the study (Appendix 1: https://www.actamedicaportuguesa.com/revista/index.php/amp/article/view/9640/5447).

The following exclusion criteria were considered: having participated in the pilot study, caregivers having not been issued the dental voucher within the 2014/2015 term or having opted out or having not completed the survey.

Ethics and moral issues considered by the Portuguese legislation were complied with (Law no. 67/98 from 26 Aug)[16] and the study was approved by the Ethics Committee of the ARS LVT (approval reference 9136/CES/ 2016) (Appendix 2:

https://www.actamedicaportuguesa.com/revista/index.php/amp/article/view/9640/5448), as well as by the Executive Director of the ACES LOO (Appendix 3: https://www.actamedicaportuguesa.com/revista/index.php/amp/article/view/9640/5449).

Upon approval by the Ethics Committee of the ARS LVT, an email was sent by the Manager of the School Health Programme of the *ACES LOO* to all the school directors with a description of the study and an invitation to their participation. A total of 35 schools (11 school groups and 1 non-grouped school) agreed to participate in the study (from a total of 62 schools [14 school groups and 4 non-grouped schools], (Appendix 4: https://www.actamedicaportuguesa.com/revista/index.php/amp/article/view/9640/5450), corresponding to a 56.5% participation rate.

In a second stage, students that have used their first dental voucher within the 2014/2015 term were cross-linked with the list of students who were enrolled in the present term, by using the *Sistema de Informação em Saúde Oral* – Oral Health Information System, in order to exclude the students who were transferred to another school and a total of 884 eligible students were obtained: 450 cases and 434 controls, to whom a questionnaire and an informed consent has been sent.

A meeting with the teacher responsible by the health education projects (EHP) was held in each of the 35 schools, including a description of the study and these teachers joined in with the class directors of the young students eligible for the participation in the study. Each teacher made the liaison between the school and the researchers.

Sample size requirement was calculated based on the formula that is usually used for case-control studies, considering a 5% significance level, 80% power, a 1:1 ratio of cases to controls, 2.5 odds ratio (OR) and a 50% rate of factor exposure in controls. A theoretical sample size of 162 students would be required (81 cases and 81 controls).[17] However, based on literature, a 20% response rate was considered as necessary in order to reach the theoretical estimated sample (162)[18] and therefore at least 810 students had to be included in the study (405 cases and 405 controls). In addition, some extra students would be required for a pre-test and therefore all the eligible students have been selected (884 students) to whom both a questionnaire and an informed consent has been sent, to be completed by each student's caregiver.

A three-part questionnaire (Appendix 5: https://www.actamedicaportuguesa.com/revista/index.php/amp/article/view/9640/5451) based on literature has been used: the first part regarding the *PNPSO* (dental voucher receiver, information on the participating dentists, oral health follow up by a private dentist and, in such a case, whether or not a participating dentist), the second regarding social and demographic characteristics of the student (age, gender, school where initial enrolment took place) and the third regarding social and demographic characteristics of the parents (or guardians) (age, gender, degree of kinship, marital status, education, occupation, occupational status and, whenever applicable, reason for inactivity) (Appendix 6: https://www.actamedicaportuguesa.com/revista/index.php/amp/article/view/9640/5452). Failure to use the first dental voucher has been considered as dependent variable. The analysis of the reasons for failure to use the dental voucher was considered for the case group. A pre-test involving 10 randomly selected caregivers was carried out, in order to assess for face validity of the questionnaire, from which no further changes were drawn.

A total of 362 responses were obtained from all the questionnaires that were sent (41% global response rate; range: 20% - 56.1%). A total of 270 validated responses were considered, upon the application of inclusion and

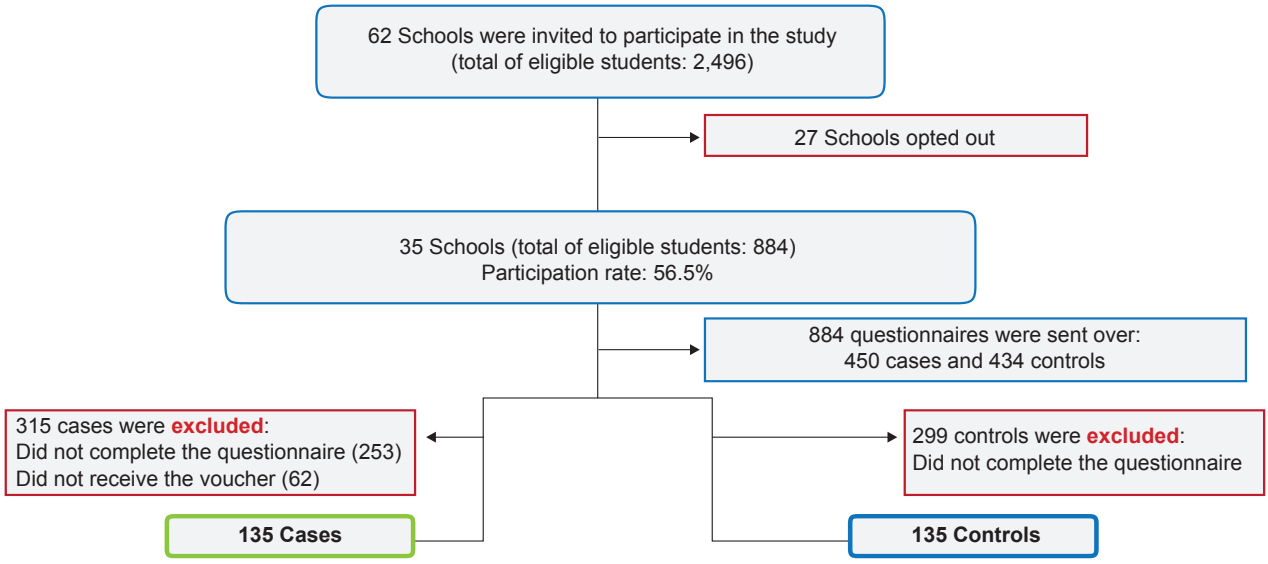

Figure 1 – Study fluxogram

exclusion criteria, 135 of which corresponding to cases and 135 to controls (Fig. 1). Data were analysed with IBM SPSS *Statistics*® version 20.0 software.

According to bivariate analysis, two groups were compared (case and controls) as regards a set of variables, among which numerical and categorical variables. Chi-square test was used for the analysis regarding categorical variables or, when this was not applicable, Fisher's exact test was used, while Student's t-test was used for numerical variables / independent or Mann-Whitney's test whenever normality was not found. Homogeneity of cases vs. controls was analysed and *p*-value for each independent variable has been calculated.[20]

Contingency tables with absolute and relative frequencies and 95% confidence intervals (CI) were obtained for each group. OR with each 95% CI was obtained and the strength and direction of the association was evaluated. The strength of the association was calculated for numerical variables through the difference in means and confidence interval, while OR and confidence intervals were used for categorical variables. As regards bivariate analysis, the variables that met the following criteria were included in multiple regression analysis: statistically significant results regarding the relationship with the dependent variable (p-value < 0.05); variables leading to p-values <0.20 even though not showing results with statistical significance regarding the dependent variable; variables with a relevance for research, even though not showing results with statistical significance.[20]

As regards multivariable analysis, multivariate logistic regression model has been applied, allowing for the removal of possible confounding factors. The magnitude of the associations was obtained through the calculation of the exponential value of the regression coefficients leading to the adjusted OR. The variable with the highest p-value was removed at a time, in order to obtain the final value of each adjusted OR for each variable throughout multivariate analysis and an optimized model with a final table including variables with a statistically significant association to failure to use the dental voucher ($p < 0.05$). Variables with missing values above 10% were excluded from the analysis.[20]

The area under the receiver operator characteristic (ROC) curve has been used for the analysis of the quality of adjustment of the logistic regression model. ROC curve allowed for the assessment of whether the estimated odds by the logistic regression have discriminated the cases of failure to use the dental voucher.[20]

The results of the optimized model of the logistic regression were confirmed through generalized estimated equations (GEE) for a uniform correlation structure of the examination of the students at school and of the logistic model. The questionnaires were subsequently destroyed once the statistical analysis was obtained, in order to ensure their privacy and confidentiality.

RESULTS

A total of 135 cases and 135 controls were included in the study. A 17% global percentage of questionnaires were excluded from the study due to the fact that caregivers were not issued the dental voucher (n = 62), showing a 0-33% range between participant schools/groups of schools, introducing an important bias in the analysis of the low use of the voucher.

The main reasons for failure to use of the dental voucher that were described by caregivers (n = 135) in the 2014/2015 term, included (i) having attended a private non-participating dentist (23.7%) and (ii) having forgotten to use the dental voucher and exceeding the expiry date (21.5%). It is worth mentioning that 10.4% described not having been able to find a participating dentist (Table 1).

When considering student's socio-demographic characteristics (Table 2), female gender was slightly more frequent in both groups (53.3% in cases *vs.* 53.3% in controls) and the highest percentage of dental vouchers

Table 1 – Reasons for failure to use dental vouchers throughout the 2014/2015 term (n = 135)

Reasons for failure to use	Absolute frequency	Relative frequency
Did not consider it necessary	20	14.8%
Forgot to use it and exceeded the expiry date	29	21.5%
Lost the voucher	6	4.4%
Did not find any participating dentist	14	10.4%
Found some participating clinics, but was not satisfied with the medical assistance	3	2.2%
Failed to use by advice from other professionals	4	3.0%
Have already used in past years, but was not satisfied with the medical assistance	1	0.8%
Was not given any information on how to use the voucher nor on its relevance	13	9.6%
Child is already followed up by a non-participating private dentist	32	23.7%
Has health insurance	8	5.9%
Did not specify	5	3.7%

Table 2 – Comparative presentation of data regarding bivariate statistical analysis for the information regarding young students (n = 270)

Variable under analysis	Category	Statistical measure	Case group[1] (n = 135)	Control group[2] (n = 135)	Odds ratio; (95% CI)	*p*-value
Gender	Male (reference)	n (%)	63 (46.7%)	63 (46.7%)	1.000; (0.620 – 1.613)	1.000
	Female	n (%)	72 (53.3%)	72 (53.3%)		
Age	7 (reference)	n (%)	21 (15.6%)	25 (18.5%)	Reference	0.572
	10	n (%)	60 (44.4%)	64 (47.4%)	1.116; (0.566 – 2.200)	
	13	n (%)	54 (40.0%)	46 (34.1%)	1.398; (0.693 – 2.817)	
School where the student attend to throughout the 2014/2015 term	AE Santa Catarina (reference)	n (%)	21 (15.6%)	25 (18.5%)	Reference	0.213
	AE Miraflores	n (%)	6 (4.4%)	14 (10.4%)	0.510; (0.167 – 1.561)	
	AE Carnaxide Portela	n (%)	11 (8.1%)	4 (3.0%)	3.274; (0.907 – 11.810)	
	AE Linda-a-Velha e Queijas	n (%)	14 (10.4%)	7 (5.2%)	2.381; (0.811 – 6.990)	
	AE São Bruno	n (%)	8 (5.9%)	11 (8.1%)	0.866; (0.294 – 2.549)	
	AE Conde de Oeiras	n (%)	3 (2.2%)	4 (3.0%)	1.176; (0.179 – 4.446)	
	AE Aquilino Ribeiro	n (%)	16 (11.9%)	17 (12.6%)	1.120; (0.457 – 2.745)	
	AE Paço de Arcos	n (%)	20 (14.8%)	24 (17.8%)	0.992; (0.433 – 2.275)	
	AE Manuel da Maia	n (%)	7 (5.2%)	8 (5.9%)	1.042; (0.324 – 3.351)	
	ES Rainha Dona Amélia	n (%)	1 (0.7%)	1 (0.7%)	1.190; (0.070 – 20.211)	
	AE Bartolmeu de Gusmão	n (%)	5 (3.7%)	8 (5.9%)	0.744; (0.211 – 2.620)	
	AE Carnaxide	n (%)	23 (17.0%)	12 (8.9%)	2.282; (0.921 – 5.655)	

AE: school group; ES: secondary school; CI: confidence interval
1: Student that did not use the voucher; **2**: Student that did use the voucher

was issued to children aged 10 (44.4% in cases *vs.* 47.4%) and the lowest to children aged 7 (15.6% in cases *vs.* 18.5%).

A lower percentage of students were enrolled in the *Escola Secundária Rainha Dona Amélia* (0.7% in case group *vs.* 0.7%) and the highest percentage of cases in the *AE of Carnaxide* (17%) and controls in the *AE Santa Catarina* (18.7%).

No differences have been found between case and control groups as regards female percentage (p = 1.000), age groups (7, 10 and 13) to whom the first dental voucher had been issued (p = 0.572) as well as regards the school/group of schools to which students attended to throughout the 2014/2015 term (p = 0.213). These data allowed us to assume the statistical homogeneity of the groups in comparison, for a 0.05 level of significance.

Female gender was predominant (83.7% *vs.* 83.0%, p = 0.870) and similar mean age was found (41.68 ± 8.39 *vs.* 40.39 ± 6.75, p = 0.166) as regards socio-demographic characteristics of caregivers (Table 3).

Student caregivers mostly corresponded to mothers (81.5% *vs.* 81.5%, p = 0.803), mostly married/living together (66.7% *vs.* 58.5%, p = 0.225), employee (77.8% *vs.*78.5%, p = 0.833), with skilled labour (82.7% *vs.* 81.1%, p = 0,769). Unemployment was the main reason for inactivity, in a lower percentage of case's caregivers (63.3% *vs.* 82.8%, p = 0.318).

A 35.1% percentage of case caregivers and 23.7% of controls had completed higher education, with a statistically significant difference (p = 0.041). A positive association between having completed higher education *vs.* failure to use the dental voucher has been found (OR = 1.739; 95% CI: 1.021 – 2.961).

Dental vouchers have been mostly issued to the student (75.8% *vs.* 85.8%, p = 0.092), considering the information on follow-up and dental vouchers (Table 4).

A lower awareness of a participating dentist has been found in caregivers from case group (14.1% *vs.* 62.2%, p < 0.001) and was associated with a 90.1% [OR = 0.099, 95% CI: 0.055 – 0.181] reduction in relative odd of failure to use the dental voucher. Instead, follow up by a private dentist throughout the 2014/2015 term was higher in the case group (67.4% *vs.* 53.3%, p = 0.018) and was associated with an 81.0% increased relative odd of failure to use the dental voucher (OR = 1.810, 95% CI: 1.104 – 2.965). It is worth mentioning that around one third of the students who failed to use the voucher did not attend regularly any private dentist.

When asked to inform whether the private dentist was participating in the programme, only in 8.8% of the cases this occurred (n = 8) and in 43.8% of the controls (n = 32). This was a statistically significant difference (p < 0.001) and follow-up by a participating dentist was associated with an 87.3% (OR = 0.123, 95% CI: 0.054 – 0.302) reduction in relative odd of failure to use the dental voucher.

A statistically significant regression model has been obtained (Omnibus test < 0.001), with a good adjustment quality (area under the ROC curve of 77.8%, p < 0.001,

Table 3 – Comparative presentation of data regarding bivariate statistical analysis for the information on caregiver (n = 270)

Variable under analysis	Categories	Statistical measures	Case group[1] (n = 135)	Control group[2] (n = 135)	Odds ratio; 95% CI	*p*-value
Gender	Male (reference)	n (%)	22 (16.3%)	23 (17.0%)	1.055; (0.556 - 2.001)	0.870
	Female	n (%)	113 (83.7%)	112 (83.0%)		
Age	Mean Median Standard deviation Range	NA	41.68 41.00 8.39 23 - 78	40.39 40.00 6.75 23 - 66	-1.289; (Difference in means)	0.166
Recoded age variable	< 45 (reference)	n (%)	96 (71.1%)	93 (68.9%)	0.900; (0.534 -1.514)	0.690
	≥ 45	n (%)	39 (28.9%)	42 (31.1%)		
Degree of kinship	Mother (reference)	n (%)	110 (81.5%)	110 (81.5%)	Reference	
	Father	n (%)	18 (13.3%)	20 (14.8%)	0.900; (0.452 – 1.793)	0.803
	Other	n (%)	7 (5.2%)	5 (3.7%)	1.400; (0.431 – 4.546)	
Marital status	Married / living together (reference)	n (%)	90 (66.7%)	79 (58.5%)	Reference	0.225*
	Single	n (%)	28 (20.7%)	31 (23.0%)	0.793; (0.438 – 1.435)	
	Divorced/separated	n (%)	14 (10.4%)	24 (17.8%)	0.512; (0.248 – 1.057)	
	Widowed	n (%)	3 (2.2%)	1 (0.7%)	2.633; (0.268 – 25.829)	
Employed	No (reference)	n (%)	30 (22.2%)	29 (21.5%)	0.958; (0.538 – 1.706)	0.833
	Yes	n (%)	105 (77.8%)	106 (78.5%)		
Reasons for inactivity	Unemployment (reference)	n (%)	19 (63.3%)	24 (82.8%)	Reference	0.318*
	Retirement	n (%)	3 (11.4%)	1 (3.4%)	3.789; (0.364 – 39.412)	
	Student	n (%)	1 (2.9%)	0 (0.0%)	0.442; (0.316 – 0.618)	
	Housewife	n (%)	6 (20.0%)	2 (6.9%)	3.789; (0.686 – 20.946)	
	Other	n (%)	1 (2.9%)	2 (6.9%)	0.632; (0.053 – 7.502)	
Education[A]	Primary to Secondary (reference)	n (%)	87 (64.9%)	103 (76.3%)	1.739; (1.021 – 2.961)	0.041
	Higher Education	n (%)	47 (35.1%)	32 (23.7%)		
Occupation[B]	Unskilled labour (reference)	n (%)	18 (17.3%)	20 (18.9%)	1.111; (0.550 – 2.245)	0.769
	Skilled labour	n (%)	86 (82.7%)	86 (81.1%)		

CI: confidence interval; NA: non applicable; **A**: Cases n = 134; **B**: Cases n = 104
* Use of Fisher's exact test; **1**: Student that did not use the voucher; **2**: Student that did use the voucher

95%CI: 0.721 – 0.834), with a 74.1% hitting estimates. Upon optimisation of the model, the variables regarding awareness of a participating dentist and follow up by a private dentist throughout the 2014/2015 term were now included. A final confirmatory multivariate model was subsequently carried out, considering a uniform correlation structure within schools in logistic regression model, using the variables of the optimised multivariate logistic regression. Similar results in multivariate analysis were found, as regards the already described effect estimates (OR), as well as their statistical significance (Table 5).

We may reach the conclusion that awareness of a participating dentist is associated with a higher use of the voucher (90.4% reduction in relative odd of failure to use the voucher, adjusted OR 0.096, $p < 0.001$). In addition, follow up by a private dentist is associated with a lower use of the voucher, with a 100% increase in the relative odd of failure to use the voucher (adjusted OR 2.004, $p = 0.012$).

DISCUSSION

The results of the study have shown that the major factor associated with the low use of the voucher is the low awareness of participating dentists by caregivers, as well as to the fact that students are already attending a private dentist. However, a significant number of students, around 1/3, did not use the voucher nor attended any private dentist and the opportunity for free-of-charge preventive and curative healthcare had been lost.

In addition, 17% of the students did not use the voucher due to the fact that this actually was not issued, showing an

Table 4 – Comparative presentation of data regarding bivariate statistical analysis of the information on the PNPSO (n = 270)

Variable under analysis	Categories	Statistical measures	Case group[1] (n = 135)	Control group[2] (n = 135)	Odds ratio; 95% CI	*p*-value
Whom the first voucher was delivered to	Student (reference)	n (%)	100 (75.7%)	115 (85.8%)	Reference	
	Caregiver	n (%)	27 (20.5%)	17 (12.7%)	1.826; (0.941 – 3.546)	0.092*
	Other	n (%)	5 (3.8%)	2 (1.5%)	2.275; (0.546 – 15.144)	
Awareness of a participating dentist	No (reference)	n (%)	116 (85.9%)	51 (37.8%)	0.099; (0.055 – 0.181)	< 0.001
	Yes	n (%)	19 (14.1%)	84 (62.2%)		
Follow up by a private dentist	No (reference)	n (%)	44 (32.6%)	63 (46.7%)	1.810; (1.104 – 2.965)	0.018
	Yes	n (%)	91 (67.4%)	72 (53.3%)		
Follow up by a participating private dentist[3]	No (reference)	n (%)	83 (91.2%)	41 (56.9%)	0.127; (0.054 – 0.302)	< 0.001
	Yes	n (%)	8 (8.8%)	31 (43.1%)		

3: Cases n = 91 and Controls n = 72

* Use of Fisher's exact test; **1**: Student that did not use the voucher; **2**: Student that did use the voucher

access problem.

According to the *II Barómetro de Saúde Oral* developed by the Portuguese Dental Association (*Ordem dos Médicos Dentistas*), around 60% of the Portuguese never attended the dentist due to financial constraints.[21] Dental vouchers (free dental treatment) were aimed at overcoming any financial constraints.[8] However, we may reach the conclusion that, in order to improve the access to oral healthcare, a single reduction in financial barriers is not effective, as also non-financial barriers, such as barriers regarding the access, low literacy and inadequate offer of dentists should be considered.[22,23]

Oral health literacy concerns "the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions".[24] According to the study *Literacia em Saúde, dos Dados à Ação: Tradução, Validação e Aplicação do European Health Literacy Survey em Portugal*, a problematic or inadequate level of health literacy has been found in 61% of the Portuguese and a mean rate of 49.2% having been found in the nine European countries in the study.[25] Caregiver's low literacy in oral health is associated with a lower oral health in children and to a lower use of healthcare services.[24]

Our results are in line with these data, as 41% of caregivers that failed to use the voucher have described as reason for the failure to use it (i) the fact that they did not consider it as relevant (14.8%), (ii) not having been provided with enough information on how to use the voucher (9.6%), (iii) having forgotten to use it (21.5%) and (iv) having lost the voucher (4.4%), showing a low appreciation of the relevance of oral health and how to use healthcare services.

An increase in participating dentists (28 to 161) aimed at children population was found in a Spanish study as having increased the use of dental vouchers from 37.4 to 67.2%, with a positive correlation between the increased extension of the program network and the percentage of use of vouchers, as well as an improvement in oral health.[26]

In our study, 10.4% of caregivers did not use the voucher due to not having been able to find any participating dentist, which may reflect a low offer of participating dentists, considering that the ARS LVT is the area with the lowest ratio of participating dentists. However, it is worth mentioning that the poor value of the dental voucher, the late reimbursement of the vouchers to dentists and computer constraints regarding the presentation of vouchers for payment were the main reasons described by dentists in Portugal for not having participated in the programme.[6]

The results of the study have shown the relevance of ensuring an effective access of patients to dental vouchers, increasing the number of participating dentists, an adequate disclosure of participating dentists, providing adequate information on how to use the voucher and adequate links with the schools.[6,10]

Despite the results, the presence of the following limitations should be considered:

- Selection biases: initially, the participation in the study was dependent on the previous authorisation of school directors followed by the authorisation of

Table 5 – Final presentation of multivariate model

Variable under analysis	Categories	Odds Ratio	95% CI	*p*-value
Awareness of a participating dentist	No Yes	0.096	(0.047 – 0.198)	< 0.001
Follow up by a private dentist	No Yes	2.004	(1.176 – 3.413)	0.012

caregivers and therefore, those who have consented in the participation would have been more available or concerned with the problem. Even though this was not a randomly selected sample, a good participation was achieved and a number of participants above what has been theoretically calculated was obtained. In addition, no statistically significant differences were found between cases and controls as regards socio-demographic characteristics, which could have led us to assume a statistical homogeneity between the groups in comparison;

- Information biases: responses to the questionnaire were referred to a time spent (2014/2015 term), leading to a possible memory bias. In addition, as this was a non-validated questionnaire, a response bias could have been introduced. A pre-test has been carried out in order to remedy this issue and allow for a readjustment of the questionnaire, should any doubt arose.

As regards external validity, i.e. the study characteristics allowing for a generalisation of the study results to other populations, final conclusions cannot be easily established. Despite the identification of the reasons and factors associated with failure to use the voucher, conclusions can be generalised to the target population, considering the methodology that was used and the type of study that was selected (adequate sample size, case-control relationship), even though the generalisation to different populations is not possible.

CONCLUSION

To our knowledge, this was the first publication of the analysis of the major factors that are associated with failure to use the dental voucher. The fact of students having been followed up by a private dentist was the main factor associated with the failure to use and the fact that caregivers are aware of a participating dentist was the major factor associated with having used the voucher.

Dematerialisation of dental vouchers in order to prevent from losing and forgetting to use the voucher and therefore increasing its use, was one of the measures that has been expected within the *Programa Simplex 2017*.[27] Results are expected by the second trimester of 2018 and therefore it should only be effective in schools by the 2018/2019 term. Even with the implementation of this measure, an increased access to dental vouchers is crucial. Even though this was an exploratory study, with no support on any previous studies, results have been plausible and will be useful not only locally but also nationally for a contribution to the design of studies and interventions in healthcare improving efficiency of the PNPSO.

HUMAN AND ANIMAL PROTECTION

The authors declare that the followed procedures were according to regulations established by the Ethics and Clinical Research Committee of the ARS LVT (approval reference 9136/CES/2016) and according to the Helsinki Declaration of the World Medical Association.

DATA CONFIDENTIALITY

The authors declare that they have followed the protocols of their work centre on the publication of patient data.

CONFLICTS OF INTEREST

The authors declare that there were no conflicts of interest in writing this manuscript.

FINANCIAL SUPPORT

The authors declare that there was no financial support in writing this manuscript.

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