

Socio-Demographic and Oral Health Related Risk Factors for Periodontal Disease in Inner North East London (INEL) Adults: A Secondary Analysis of the INEL Data

Ghosh-Dastidar R^{1*}, Gillam DG² and Islam SS³

¹Clinical and Diagnostic Oral Sciences, Barts and The London School of Medicine and Dentistry, Queen Mary's University of London, London, UK

²Adult Oral Health, Barts and The London School of Medicine and Dentistry, Queen Mary's University of London, London, UK

³BSMMU Shahabag Avenue Dhaka, Bangladesh

*Corresponding author: Ricky Ghosh-Dastidar, Clinical and Diagnostic Oral Sciences, Barts and The London School of Medicine and Dentistry, Queen Mary's University of London, London, UK, E-mail: Rickyghosh@yahoo.com

Received date: 15 Jul 2016; Accepted date: 24 Aug 2016; Published date: 29 Aug 2016.

Citation: Ghosh-Dastidar R, Gillam DG, Islam SS (2016) Socio-Demographic and Oral Health Related Risk Factors for Periodontal Disease in Inner North East London (INEL) Adults: A Secondary Analysis of the INEL Data. *Int J Dent Oral Health* 2(7): doi <http://dx.doi.org/10.16966/2378-7090.215>

Copyright: © 2016 Ghosh-Dastidar R, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Abstract

Introduction: Periodontal disease is a serious collection of diseases which can lead to chronic inflammation, the destruction of tooth supporting structures and ultimately; tooth loss. It is also one of the most common diseases of the oral cavity and the major cause of tooth loss in adults and may have a major impact on the quality of life of those who suffer with the condition.

Objectives: To determine the socio-demographic and oral-health-related risk factors for periodontal disease in a sample of adults living in Inner North East London (INEL), UK.

Methods: A secondary analysis was conducted on data from the 2008 survey on 'The Oral Health of Adults in INEL.' Data were entered into the Statistical Package for Social Sciences (SPSS v19, IBM UK Ltd, Portsmouth, UK) and analysed using descriptive analysis, chi-squared tests ($P \leq 0.05$), together with multivariate regression analysis. The original survey employed a multi-stage sampling procedure and the final sample size was 361. All of the participants were selected from the London Boroughs of Tower Hamlets, City and Hackney and Newham. Periodontal disease indicators, such as the loss of clinical attachment and periodontal pocket depths were cross-matched with socio-demographic and oral health-related behaviours. Associations between the two were ascertained using chi-squared statistics and multivariate regression analysis. The case-definition adopted to indicate the presence of periodontal disease was "a clinical loss of attachment and periodontal pocketing of four millimetres or more, in at-least one tooth respectively".

Results: The prevalence of periodontal disease in the original INEL sample was 39.3%. Age and gender were the variables most commonly associated with periodontal disease. The prevalence of disease demonstrated an increase with age, and in terms of gender, 48.7% of males were observed to have periodontal disease compared to 32.2% of females. Ethnicity ($p=0.005$) and area of residence ($p=0.005$) were more directly associated with periodontal pocket depth ≥ 4 mm. Dental attendance ($p=0.04$) and education ($p=0.02$) were more directly associated with clinical loss of attachment. When assessing the combined outcomes, multivariate regression analysis showed that after controlling for age and gender, subjects without a work-related qualification were more likely to have periodontal disease (OR=1.780, 95% C.I. 1.066-2.973). Dental attendance was identified as another significant predictor of periodontal disease for example subjects who never visited a dentist were at more risk than the regular attenders (OR=3.700, 95% C.I. 1.448-9.458).

Conclusion: The overall prevalence of periodontal disease in an Inner North East London sample was observed to be slightly higher but generally comparable with respect to the national average, as determined by the UK Adult Dental Health Survey (1998). Of the various socio-demographic and oral-health-related risk factors analysed in the present study, age, gender, work-related qualification and dental attendance were observed to increase the likelihood of periodontal disease. Furthermore, epidemiological studies should be implemented in order to develop prevention strategies which should focus on improving access to dental services in the local community in order to reduce periodontal disease rates.

Keywords: Socio-demographic factors; Periodontal disease; Secondary analysis

Introduction

Periodontal disease is a serious collection of diseases which can lead to chronic inflammation, the destruction of tooth supporting structures and ultimately; tooth loss. It is also one of the most common diseases of the oral cavity and the major cause of tooth loss in adults [1]. For the purpose of the present study, periodontal disease was viewed as a single entity although it should be acknowledged that other symptoms can include bleeding on brushing, loosening of affected teeth and persistent bad breath. All of these outcomes are highly relevant from a patient's point

of view and have a considerable impact on their daily quality of life [2]. Additionally, some studies have reported that patients with periodontal disease are more likely to suffer systemic health problems such as cardiovascular complications and ischemic stroke [3].

The dental community has generally acknowledged three causal factors for periodontal disease, namely; micro-organisms, substrate and host factors. The first two components have been examined extensively but recent research has focussed more on the biological and genetic susceptibility of the host. However, there has been less specific emphasis

on the psycho-social characteristics of the host in preventing and responding to periodontal disease. These include the attitudes and beliefs of the individual, as well as their personal, social and cultural values [4]. Other factors, such as anxiety and ease of access to dental surgeries can also play a significant role in the periodontal health outcomes of the individual. The former was reported in a study by Torabi-Gaarden et al. [5] which stated that psychological stress may negatively affect the outcome of periodontitis and several studies in various populations have also confirmed an association between negative life events, levels of depression, anxiety and periodontal disease.

Age and gender have been well documented in previous studies as factors contributing to periodontal disease. The authors of the United Kingdom Adult Dental Health Survey of 1998 identified age as “the most significant variable in explaining the variation in the majority of clinical measures of oral health” [6]. In relation to gender, a key paper by Burt (2005) [7] examining the epidemiology of periodontal diseases stated the following causal explanation; “males usually exhibit poorer oral hygiene than females and gender differences are thought to be more related to poorer oral hygiene, a less positive attitude towards oral health and dental-visit behaviour among males, rather than any genetic factor”.

In Inner North East London (INEL), UK, where the three boroughs of Newham, Tower Hamlets and Hackney remain the most deprived in London, significant health inequalities exist within the boroughs. These inequalities are predominantly due to socio-demographic factors, such as age, gender and ethnicity [8]. The socio-economic status of some of these populations is among the lowest in the country, and data from 2005 indicated that 66.7% of under-16s were living in low income households. This was considered to be the highest level of childhood poverty in London, and child oral health fared unfavourable in Tower Hamlets and Newham compared to the other London boroughs [9]. There was also substantial ethnic diversity within the area, and according to the 2001 UK Census, the percentage of residents in Newham, Tower Hamlets and Hackney, who classified themselves as non-white were 60%, 49% and 41% [10]. A comprehensive study on periodontal disease has not previously focussed on Inner North East London and the data used was sourced from the highly reliable and robust Oral Health of Adults in the INEL study (2008). Due to the diverse range of socio-demographic factors reported in the region, one of the main strengths of this study was the ability to identify patterns of periodontal disease in accordance with specific socio-demographic and oral-health related factors.

There are a number of established systemic risk factors that have been associated with periodontal disease and have been extensively reviewed in the published literature [11]. For example, modified (tobacco smoking, micro-organisms, Type II Diabetes, cardiovascular disease) and non-modifiable (osteoporosis, female hormones, host response) risk factors (Table 1) [11]. Furthermore known risk characteristics (age, gender, socioeconomic status [SES] etc.) may also play a role in increasing the risk of periodontal disease (Table 2) [11]. The secondary analysis included in the present study will however focus on factors associated with specific socio-demographic and oral-health related factors.

Modifiable	Non-Modifiable
Microorganisms	Osteoporosis
Tobacco smoking	Hematological Disorders
Diabetes Mellitus	Host Response
Cardiovascular Disease	Female Hormonal Alterations
Drug-Induced Disorders	Pregnancy
Stress	
Obesity	

Table 1: General Risk Factors for Periodontal Disease (AlJehani [11]).

Risk Characteristic
Age
Sex (Gender)
Socioeconomic Status (SES)
Education and Race
Genetic Considerations
C-Reactive Protein

Table 2: Risk Characteristics for Periodontal Disease (AlJehani [11])

Materials and Methods

The original INEL survey was cross-sectional in design and conducted in two parts. In the first part, where questionnaires were completed by respondents and the second part involved clinical examinations of those respondents by trained and calibrated dentists in accordance to the guidelines laid down to conduct national epidemiological surveys [12]. Ethical and research governance approval was sought from the North East London Research and Ethics Committee and research governance approval was also granted from the Primary Care Trusts, which acted as the primary sampling units of the overall study design. All the information for the survey was provided to the subjects on an information sheet and full consent was sought prior to participation. For those participants whose first language was not English, interpreters were provided, and they accompanied the dentists during both the process of data collection and clinical examinations. The original survey employed a multi-stage sampling procedure with the primary sampling units being the Primary Care Trust localities and the final sample size was 361. It should be noted that the present paper is based on the secondary analysis of data collected from the INEL study [12] and as such there was no requirement for calculating a suitable sample size.

To measure periodontal disease, levels of periodontal pocket depth (PP) and clinical attachment loss (CAL) were measured independently on each tooth using a periodontal probe. PP was recorded from the gingival crest to the base of the pocket and CAL was recorded from the base of the pocket to the cemento-enamel junction (CEJ). Two sites were measured on each tooth (mesially and distally) and these two sites were situated buccally on the upper teeth and lingually on the lower teeth.

In the original INEL study [12], a case-definition of periodontal disease was devised in order that the presence of disease could be denoted. This was based on the definition by Marcenes and Bernabe [13] which stated that periodontal disease was present when there are at-least two proximal sites with CAL \geq 4 mm and one proximal site with PP \geq 4 mm, not necessarily on the same tooth. The definition subsequently used for this study [12] was “periodontal disease is present when a clinical loss of attachment and periodontal pocket depth \geq four millimetres is found in at-least one tooth respectively”.

All the data collected was pre-coded and entered into the Statistical Package for Social Sciences (SPSS 19, IBM UK Ltd, and Portsmouth, UK) software. After the initial descriptive analysis, chi-squared tests were used to investigate whether there were any statistically significant differences between the socio-demographic variables and periodontal disease. Due to age and gender being well established predictors of periodontal disease, these variables were considered as confounding factors in order to establish specific socio-demographic and oral health-related variables leading to periodontal disease. For all the tests, a significance level of 0.05 was used and confidence intervals were set to 95%. Finally, the variables observed to have reached statistical significance were corroborated by multivariate regression analysis in order to identify the most relevant predictors for periodontal disease.

Results

Demographic data

The number of individuals who had completed both the original survey and a clinical examination [12] was 361 subjects. The response rate was 37.4% and all participants were selected from the London Boroughs of Tower Hamlets, City and Hackney and Newham. Of the respondents, 43.2% were male and 56.8% were female. In terms of age, 44.9% were between 16 to 34, 21.6% were between 35 and 44 and 33.5% were 45 and over. In relation to Ethnicity, Asians were most commonly included in the sample and accounted for 56% of the respondents (Table 3). The percentage of individuals with a work related qualification was 42.6% (Table 4).

The Prevalence of periodontal disease

The percentage of subjects from the general sample with periodontal pocket depth of ≥ 4 (as defined) [13] was 56% and the percentage with clinical attachment loss was 46.8%. When these outcomes were combined, the percentage of the sample with both was 39.3%.

Socio-demographic factors and periodontal disease

The association between periodontal disease and the age, gender and work-related-qualification variables are shown in Table 4. Age and gender were the variables most commonly associated with periodontal disease. The prevalence of disease demonstrated an increase with age, and in terms of gender, 48.7% of males were observed to have periodontal disease as defined [13] compared to 32.2% of females.

When the presence of a work-related qualification was assessed, this variable demonstrated a statistically significant association with periodontal disease (e.g., 45.6% of those without any qualification exhibited periodontal disease compared to 30.7% of those with a qualification). There were no statistical association with the other variables such as area of residence, ethnicity and marital status for periodontal disease (Table 4).

Ethnicity	Male n (%)	Female n (%)	Total n (%)
Asian	82 (40.6)	120 (59.4)	202 (56.0)
White	48 (49.5)	49 (50.5)	97 (26.9)
Black	20 (42.6)	27 (57.4)	47 (13.0)
Other	6 (40.0)	9 (60.0)	15 (4.2)
Total	156 (43.2)	205 (56.8)	361 (100)

Table 3: The number and percentage of adults examined according to gender and ethnicity.

	Periodontal		p
	Pocket Depth ≥ 4 mm and Loss of attachment ≥ 4 mm	n (%)	
Age			
16-34	35 (21.6)		0.005
35-44	41 (52.6)		
45+	66 (54.5)		
Total	142 (39.3)		
Gender			
Male	76 (48.7)		0.005
Female	66 (32.2)		
Total	142 (39.3)		
Work Related Qualification			
Yes	47 (30.7)		0.005
No	94 (45.6)		
Total	141 (39.3)		

Table 4: Periodontal Disease by age, gender and work-related qualification

Oral hygiene behaviour and periodontal disease

According to the questionnaire in the original INEL survey, when the respondents were asked about Dentistry in the UK, they generally agreed with the four following statements:

1. I find National Health Service (NHS) dental treatment expensive
2. I don't want any intricate dental treatment
3. I would like to be able to drop into the Dentist without an appointment
4. I would like to know more about what the Dentist is going to do and why?

Although, the information in the original survey was useful in terms of future planning of dental services in the area, no association was observed between these answers and the rate of periodontal disease. However, one of the questions relating to dental attendance showed that 43.2% of subjects who never visited the dentist had periodontal disease, compared to 25.4% of those that were regular attenders ($P=0.06$).

Multivariate regression analysis to establish the predictors of periodontal disease

A logistic regression model was established using backward stepwise elimination, with combined PP and CAL (≥ 4 mm) as the dependent variable. The co-variables were then entered into the model according to the variables which were found to be statistically significant ($P \leq 0.05$). These variables included age, gender, work-related qualification and dental attendance. Other variables which had been observed to be significant for the separate periodontal outcomes, such as ethnicity, borough of residence and frequency of tooth brushing were also entered into the model. However, these variables were not observed to be statistically significant for the combined outcome when adjusting for confounding factors (Table 5).

Gender and age showed the clearest statistical significance. Males were more than twice as likely to be affected, compared to the females (OR=2.162, 95% Confidence Intervals [C.I.] 1.325-3.526) and subjects aged forty-five and over were more than four times as likely to be affected than those aged between fifteen and thirty-four (OR=4.137, 95% C.I. 2.344-7.300). Education, in the form of a work-related qualification, was another factor observed to influence periodontal disease. The subjects without a work-related qualification were observed to be more likely to have periodontitis compared to those subjects with a work-related qualification (OR=1.780, 95% C.I. 1.066-2.973). The fourth and final

Variable	OR	Standard Error	p	95% C.I.
Gender				
Female	1	0.25	0.005	1.325-3.526
Male	2.162			
Age				
15-34	1	0.314	0.005	2.134-7.294
35-44	3.945	0.29	0.005	2.344-7.300
45+	4.137			
Work-related qualification				
Yes	1	0.262	0.028	1.066-2.973
No	1.78			
Frequency of dental visits				
Regularly	1	0.369	0.021	1.135-4.825
Occasionally	2.34	0.343	0.043	1.021-3.925
Only with trouble	2.002	0.479	0.006	1.448-9.458
Never	3.7			

Table 5: Odds ratios (OR) showing risk factors for periodontal disease using multivariate regression analysis

factor observed to influence the likelihood of periodontal disease was the frequency of dental visits. Compared to the regular visitors, subjects who visited only when they were in need of treatment showed higher affected levels (OR=2.002, 95% C.I. 1.021-3.925), the occasional visitors were also more affected (OR=2.340, 95% C.I. 1.135-2.825), and the most affected subjects were those subjects who claimed to never have visited a dentist (OR=3.700, 95% C.I. 1.448-9.458) (Table 5).

Discussion

The general aim of the present study was to conduct a secondary analysis on data collected for the Inner North East London adults which was designed to establish the prevalence of periodontal disease in Inner North East London adults as well as to investigate the specific socio-demographic and oral health-related variables associated with periodontal disease.

Periodontal disease prevalence

The prevalence of periodontal disease observed in the sample was 39.3%. When considering the two components of periodontal disease separately, the overall prevalence in Inner North East London was observed to be slightly higher compared to the national average. For example, in the UK Adult Dental Health Survey [6] reported prevalence rates of PP and CAL (≥ 4 mm) as 54% and 43% which were reasonably similar to those rates recorded in the original INEL survey of, 56% (PP) and 47% (CAL). The debate with regard to case definitions for periodontal disease have previously led to conflicting prevalence rates in the published literature, the definition used to denote periodontal disease status in the original INEL survey was based on periodontal pocket depth ≥ 4 mm and clinical attachment loss ≥ 4 mm, in at-least one tooth respectively. This particular definition was selected as having the most suitable criteria and threshold for periodontal disease although it is recognised that other case definitions have also been widely used in epidemiological surveys. For example, Eke et al. [14] suggested a case definition for mild periodontitis as ≥ 2 interproximal sites with AL ≥ 3 mm and ≥ 2 interproximal sites with PD ≥ 4 mm (not on the same tooth) or one site with PD ≥ 5 mm. It is evident, however as these Investigators reported, changing case definitions may have an impact on the prevalence rates for periodontal disease. It is, therefore important that the scientific community work towards adopting a more uniform definition for periodontal disease. This would enable a clearer comparison between different individuals and communities, and indicate more effectively the important changes in prevalence and severity.

Education

The respondents' level of education was observed to be a significant predictor of periodontal disease after controlling for age and gender. Although this predictor was evaluated using the presence of a work-related qualification, it may also encompass other aspects of education, such as the respondents' level of oral health education. Increasing oral health education in schools as well as in dental clinics may also be an effective method of combating periodontal disease.

Dental attendance

The frequency of dental visits was clearly associated with periodontal disease status, after adjusting for age and gender. This would indicate that more regular visits to the dentist would effectively reduce the likelihood of periodontal disease, however it would be interesting to conduct a

survey with regard to assessing the efficacy of treatment options including maintenance visits in Dental practices. Nevertheless, more emphasis should be given towards promoting dental attendance within the community by encouraging access to dental practices as well as reducing or removing potential barriers in accessing dental treatment.

Conclusion

The overall prevalence of periodontal disease in an Inner North East London sample was observed to be slightly higher, but generally comparable with respect to the national average, as determined by the UK Adult Dental Health Survey (1998). Of the various socio-demographic and oral-health-related risk factors analysed in the present study, age, gender, work-related qualification and dental attendance were observed to increase the likelihood of periodontal disease. Furthermore, epidemiological studies should be implemented in order to develop prevention strategies which should focus on improving access to dental services in the local community in order to reduce periodontal disease rates.

References

- Guthmiller JM, Novak K (2002) Periodontal Diseases. In: Brogden KA, Guthmiller JM (Eds) Polymicrobial diseases ASM Press; Washington, D.C, USA.
- Ng SK, Leung WK (2006) Oral health-related quality of life and periodontal status. *Community Dent Oral Epidemiol* 34: 114-122.
- Scannapieco FA, Bush RB, Paju S (2003) Associations between periodontal disease and risk for atherosclerosis, cardiovascular disease, and stroke. A systematic review. *Ann Periodontol* 8: 38-53.
- Kiyak HA, Persson RE, Persson GR (1998) Influences on the perceptions of and responses to periodontal disease among older adults. *Periodontol* 2000 16: 34-43.
- Torabi-Gaarden R, Breivik T, Frode Hansen B, Malt UF, Gjermo PE (2004) Negative Life Events, Anxiety, Depression and Coping Ability (Stress) as Related to Chronic Periodontitis. *Perio* 1: 35-42.
- Kelly M, Steele J, Nuttall N (2000) Adult dental health survey. Oral health in the United Kingdom 1998. The Stationery Office; London.
- Burt B (2005) Position paper: epidemiology of periodontal diseases. *J Periodontol* 76: 1406-1419.
- Banerjee S (2010) Health Inequalities in East London: Health equity in primary care conference; Slide 4.
- NHS East London, and The City.
- NHS North East London, C.C.G.s. Collaborative commissioning for North East London. 2011.
- AlJehani YA (2014) Risk Factors of Periodontal Disease: Review of the Literature. *Int J Dent*.
- Awojobi O, Wright D, Pearson N, Islam S, Croucher R (2009) Oral Health of Adults in Inner North East London, 2008: City and Hackney, Newham and Tower Hamlets Primary Care Trusts.
- Bernabe E, Marcenes W (2010) Periodontal disease and quality of life in British adults. *J Clin Periodontol* 37: 968-972.
- Eke PI, Page RC, Wei L, Thornton-Evans G, Genco RJ (2012) Update of the case definitions for population-based surveillance of periodontitis. *J Periodontol* 83: 1449-1454.