Polymorphisms Associated to Periodontitis in Patients with Down Syndrome

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BACKGROUND

Down syndrome (DS) is one of the most common chromosomal condition in humans, expressing during cell division by presenting an additional copy of chromosome 21. Patients with DS have a greater tendency to present inflammatory disorders such as periodontal disease (PD), which is a chronic inflammatory illness that affects the gum, periodontal ligament and alveolar bone. At cellular level there are elements such as cytokines that actively participate in inflammatory processes; some studies suggest that cytokine polymorphisms could be associated with PD through a pro-inflammatory susceptibility. Some of these cytokines are CCL5, CCR5 and TNF-α. Therefore, the aim of this research was to determine the presence of polymorphisms in CCL5, CCR5 and TNF-α genes, in patients with or without DS affected or not by PD.

METHODS

A case-control study was carried out in the diagnostic department of the Faculty of Dentistry of the UADY. 24 patients with DS and different degrees of PD were recruited; patients without DS were selected as controls. Periodontal examinations were performed to confirm the diagnoses and saliva samples were obtained to determine the presence of polymorphisms by qPCR. For the polymorphisms, the Hardy-Weinberg frequency and odds-ratio was determined.

RESULTS

Genotyping of the -403 G/A Polymorphism of the CCL5 Gene

Healthy	Genotypic Frequencies GG	GA	AA	Allelic Frequencies G	A
Cases	0 (0%)	3 (100%)	0 (0%)	3 (50%)	3 (50%)
Controls	4 (40%)	4 (40%)	2 (20%)	12 (60%)	8 (40%)
OR		7.0000	1.8000		1.5000
95% CI		0.2745 - 178.4763	0.0266 - 121.712		0.2398 - 9.3828

PD I - II	Genotypic Frequencies GG	GA	AA	Allelic Frequencies G	A
Cases	3 (18.75%)	6 (37.5%)	7 (43.75%)	9 (34.62%)	17 (65.38%)
Controls	3 (60%)	0 (0%)	2 (40%)	6 (60%)	4 (40%)
OR		13.0000	3.5000		2.8333
95% CI		0.5114 - 330.4968	0.3715 - 32.9726		0.6315 - 12.7129

PD III - IV	Genotypic Frequencies GG	GA	AA	Allelic Frequencies G	A
Cases	0 (0%)	4 (100%)	0 (0%)	4 (50%)	4 (50%)
Controls	3 (60%)	1 (20%)	1 (20%)	7 (70%)	3 (30%)
OR		21.0000	2.3333		2.3333
95% CI		0.6391 - 690.0306	0.0298 - 182.924		0.3365 - 16.1808

*GG: wild type; GA: heterozygous genotype; AA: homozygous mutated genotype; OR: odds ratio *p<0.05, **p<0.01*

Genotyping of the G59029A Polymorphism of the CCR5 Gene

Healthy	Genotypic Frequencies GG	GA	AA	Allelic Frequencies G	A
Cases	1 (33.3%)	1 (33.3%)	1 (33.3%)	3 (50%)	3 (50%)
Controls	2 (20%)	2 (20%)	6 (60%)	5 (25%)	15 (75%)
OR		1.0000	0.3333		0.3333
95% CI		0.0335 - 29.8093	0.0136 - 8.1830		0.0502 - 2.2143

PD I - II	Genotypic Frequencies GG	GA*	AA*	Allelic Frequencies G	A**
Cases	2 (12.5%)	7 (43.75%)	7 (43.75%)	11 (34.4%)	21 (65.6%)
Controls	4 (80%)	1 (20%)	0 (0%)	9 (90%)	1 (10%)
OR		14.0000	27.0000		17.1818
95% CI		0.9441 - 207.6072	1.0432 - 698.8322		1.9210 - 153.6815

PD III - IV	Genotypic Frequencies GG	GA	AA	Allelic Frequencies G	A
Cases	0 (0%)	1 (25%)	3 (75%)	1 (12%)	7 (88%)
Controls	2 (40%)	3 (60%)	0 (0%)	7 (70%)	3 (30%)
OR		2.1429	35.0000		16.3333
95% CI		0.0592 - 77.5408	0.5029 - 2435.8820		1.3489 - 197.7784

*GG: wild type; GA: heterozygous genotype; AA: homozygous mutated genotype; OR: odds ratio *p<0.05, **p<0.01*

Genotyping of the -308 G/A Polymorphism of the TNF- α Gene

Healthy	Genotypic Frequencies GG	GA	AA	Allelic Frequencies G	A
Cases	3 (100%)	0 (0%)	0 (0%)	6 (100%)	0 (0%)
Controls	9 (90%)	1 (10%)	0 (0%)	19 (95%)	1 (5%)
OR		0.9048	2.7143		1.0000
95% CI		0.0294 - 27.8601	0.0447 - 164.9499		0.0361 - 27.7016

PD I - II	Genotypic Frequencies GG	GA	AA	Allelic Frequencies G	A
Cases	15 (94%)	1 (6%)	0 (0%)	31 (97%)	1 (3%)
Controls	5 (100%)	0 (0%)	0 (0%)	10 (100%)	0 (0%)
OR		1.0645	0.3548		1.0000
95% CI		0.0375 - 30.1973	0.0063 - 20.1420		0.0378 - 26.4693

PD III - IV	Genotypic Frequencies GG	GA	AA	Allelic Frequencies G	A
Cases	4 (100%)	0 (0%)	0 (0%)	8 (100%)	0 (0%)
Controls	4 (67%)	0 (0%)	2 (33%)	8 (67%)	4 (33%)
OR		1.0000	0.2000		0.1111
95% CI		0.0161 - 62.3051	0.0073 - 5.4532		0.0051 - 2.3997

*GG: wild type; GA: heterozygous genotype; AA: homozygous mutated genotype; OR: odds ratio *p<0.05, **p<0.01*

DISCUSSION

Authors	Year	Conclusions
Shih *et al.*	2014	The -403 G/A polymorphism of the CCL5 gene may play an important role in the development of periodontal disease.
Martínez-Aguilar *et al.*	2018	The G59029A Polymorphism of the CCR5 gene observed a significant association between the presence of the polymorphism and chronic periodontitis.
Azab y Elfasakhany	2022	The -308 G/A polymorphism of the TNF-α gene did not present significant variations in the distribution of genotypes and alleles of the polymorphism between subjects with periodontitis and controls.

CONCLUSION

The polymorphism G59029A of the gene CCR5 could be considered a risk factor in patients with DS for developing periodontitis in its different stages.

REFERENCES