

**ABO Blood Groups and Oral Malignancy- A Mini Review**

<sup>1</sup>Smit Singla, M.D.S. Reader, Dept. of Oral Medicine & Radiology, Daswani Dental College and Research Centre, Kota, India.

<sup>2</sup>Snehal Goyal, B.D.S., General Practitioner.

<sup>3</sup>Akhilesh Verma, M.D.S. Senior Resident, Dept. of Dentistry M.D.M. Hospital Jodhpur, India.

<sup>4</sup>Itika Singla, B.D.S., General Practitioner.

<sup>5</sup>Anjali Shetty, M.D.S. Assistant Professor, Dept of Oral Medicine & Radiology, A.J. Institute of Dental Sciences, Mangalore, India.

**Corresponding Author:** Dr. Smit Singla, Reader, Department of Oral Medicine and Radiology, Daswani Dental College and Research Center, Kota, Rajasthan, India

**Citation of this Article:** Smit Singla, Snehal Goyal, Akhilesh Verma, Itika Singla, Anjali Shetty, “ABO Blood Groups and Oral Malignancy- A Mini Review”, IJDSIR- January - 2021, Vol. – 4, Issue - 1, P. No. 454 – 457.

**Copyright:** © 2021, Dr. Smit Singla, et al. This is an open access journal and article distributed under the terms of the creative commons attribution noncommercial License. Which allows others to remix, tweak, and build upon the work non commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**Type of Publication:** Review Article

**Conflicts of Interest:** Nil

**Abstract**

Oral malignancy is reported to have one of the highest mortality rate among other malignancies. Oral malignancy is characterized by abnormal growth of cells which have the ability to invade the adjacent structures which includes tissue and bones and sometime to even distant organs. It has multi-factorial etiology which includes risk factors and genetic factors. Many times it was said that the ABO blood groups have influence on the oral pre-malignancy and malignancy. The surface of red blood cells and various epithelial cells express ABO blood group antigens which are said to have some role in oral malignancy. Various studies carried out till date which shows different blood groups have different predisposition for oral pre-malignancy and malignancy.

**Keywords:** Oral malignancy, ABO blood group, susceptibility

**Introduction**

It is well established that presence of premalignant lesion or condition will subsequently develop into malignancy in the oral mucosa. As the incidence and the death rate due to oral malignancy is increasing day by day despite the recent advances in the diagnosis and in the management. So much more intense efforts are required to fight with this malignancy. The ultimate goals are to reduce both mortality and morbidity, and to improve individual's quality of life.

For the transfusion reactions and organ transplantation ABO blood group system has been regarded as most important factor. The ABO blood type system comprises

four blood groups: O, A, B, AB. Individuals of all blood groups have a common H antigen on red blood cell membrane surface, which is coded for by the H gene on chromosome 19. This H antigen may be further acted by enzymes, depending on the presence of ABO genes on chromosome 9. H antigen is converted into A and B antigen in A and B blood group respectively. Individuals with O blood group have the highest amount of H antigen as compared to other blood groups. Among the Indian population O<sup>+VE</sup> is most commonly found (37.12%) followed by B<sup>+ve</sup> (32.25%), A<sup>+ve</sup> (28.88%), AB<sup>+VE</sup>(7.74%), O<sup>-VE</sup> (1.79%), B<sup>-VE</sup> (1.47%), A<sup>-VE</sup> (0.57%), AB<sup>-VE</sup> (0.49%) [1-4].

### Discussion

Risk factors which are associated with etiology of oral pre-malignancies and malignancy are modifiable whereas ABO blood group is genetically determined and not a modifiable. Association between ABO blood group and malignancy were first explored by Alexander in 1921[5]. In 2005 Dabelsteen and Gao found that the incidence of various carcinoma is higher in A/B blood groups due to higher affinity of these antigens to some micro organisms known to develop cancer[6].

As said earlier about H antigen which is present highly in O blood group as compared to other blood groups. H antigen is reported to have anti cancer properties. In individuals with blood group A and B this antigen H is converted to respectable A and B antigen so protection from H antigen is not available in these individuals. Due to expression of A- like antigen (Forssmann or Tn antigen) individuals with blood group A are to at higher risk of developing malignancies. A antigen expression are seen in malignant cells even in individuals with B or O blood groups. So, antibodies to A antigen can attack premalignant and malignant cells. Individuals with blood groups A and AB lack these kind of antibodies so, more

prone towards malignancy[4,6-9]. Tyagi et al in 1965, Mittal and Gupta in 1969, Nayak in 1971, Baruah and Gogoi in 1977, Raghvan, Bailoor and Jhansirani in 1986 conducted studies in India and they found individuals with blood group A are more prone towards malignancy as compared to the individuals with other blood groups[10-14]. Jaleel and Nagarajappa in 2012 concluded that individuals with blood group A had 1.4 times higher risk of developing oral cancer followed by B blood group (1.1 times). AB (0.9 times) and O (0.6 times)[5].

The isoantigens of ABO blood group system present on red cells are also present on epithelial cells and its secretions. Expressions of these ABH antigens are correlated with epithelial differentiation and cell maturation. Decrease in expression or complete deletion of A/B antigen in oral, bladder and lung cancer has been reported which indicates poor prognosis. So, therefore change in the expression of A/B antigen may be early event in the process of malignancy development [15-21].

In oral malignancy expression of ABH antigens is described as incomplete synthesis with accumulation of precursor structures. The loss of A/B antigen expression is due to lack of the A and B gene-encoded transferase activity. Molecular genetic studies of human ABO gene had shown that loss of expression of A-transferase is related to loss of chromosomal areas, including 9q34 (which is the locus of ABO genes) in bladder carcinoma. Similar mechanism is suggested in the preliminary study of oral carcinomas [15, 22-25].

The function of key receptors such as EGF, integrin, cadherin and CD44 are influenced by ABO antigens. These receptors regulate cell proliferation, adhesion and movement. Expression of these receptors are widely varies in normal and malignant cells, role of ABO antigens is also widely variable in tumorigenesis [26&27].

Sharma, Choudhary and Bharti in 2007 concluded that blood group B is more prone towards carcinoma of buccal mucosa with frequency of 34.1% followed by blood group A (30.4%), O (28.0%), and AB (7.3%) [28]. Akhtar, Mehdi, Sherwani, Sofi in 2010 concluded that oral cancer is highest among individuals with blood group B (37.5%) followed by blood group A (35%), O (20%) and AB (7.5%) [29]. Hamed Mortazavi et al in 2014 concluded that individuals with blood group B are more prone to oral cancer as compared to other blood groups [30].

As we discussed and results of afore-mentioned studies we can say that incidence of oral malignancy seems to be significantly higher in non-O groups and risk of malignancy is increased in the presence of A and B antigens.

### Conclusion

From this correlation of oral malignancy with these blood groups, it is inferred that there is inherited element that might be implicated in the susceptibility or protection against the development of malignancy. For better understanding this association more exploration needs to be done between this genetic element and environmental, racial factors.

### References

1. Rao MSS, Abraham TT. A retrospective study of blood groups in head and neck malignancies. J. Evid. Based Med. Healthc, vol. 10, no. 5, 2018, p. 908-12.
2. Anamika Joshi, Jyoti S Kumar, Sugandha Arya, Ankita Bohra. ABO Blood groups and RH factor association with Oral Submucous Fibrosis: A clinical short study in Jodhpur population. IJMSDR, vol. 3, no. 8, 2019, p. 76-80.
3. Bhateja S, Arora G. ABO blood groups and oral premalignancies: A clinical study in selected Indian population. Indian J Cancer, vol. 51, 2014, p. 219-21.

4. Jacobina J, Masthan K.M.K, Babu N. A, Rajesh E, Malathi L. ABO blood grouping and susceptibility to oral cancer and potentially malignant disorders. Biomed Pharmacol J vol. 8, 2015, ( October Spl Edition). Available from: <http://biomedpharmajournal.org/?p=3744>>
5. Jaleel BF, Nagarajappa R. Relationship between ABO blood groups and oral cancer. Indian J Dent Res, vol. 23, 2012, p. 7-10.
6. Dabelsteen E, Gao S. ABO blood-group antigens in oral cancer. J Dent Res vol. 84, 2005, p. 21-8.
7. Auclair CL. Altered H antigen reactivity as an indicator of malignant transformation in oral epithelium. J Oral Pathol, vol. 13, 1984, p. 401-11.
8. Hakomori S. Antigen structure and genetic basis of histo-blood groups A,B and O: their changes associated with human cancer. Biochem Biophys Acta, vol. 1473, no. 1, 1999, p. 247-66.
9. Marionneau S, Le Moullac Vaidye B and J Le Pendu. Expression of histo blood group A antigen increases resistance to apoptosis and facilitates escape from immune control of rat colon carcinoma cells. Glycobiology, vol. 12, no. 12, 2002, p. 851-6.
10. Tyagi SP, Pradhan S Agarwal P. Blood groups in malignant diseases. J Indian Med Assoc., vol. 45, 1965, p. 645-50.
11. Mittal VP, Gupta S. The study of ABO blood groups in oral cancer. J Cancer, vol. 6, 1969, p.34-7.
12. Nayak SK. ABO blood groups in different diseases. J Indian Med Assoc., vol.57, 1971, p. 449-52.
13. Baruah BD, Gogoi BC. Blood groups in cancer in Assam, India. Indian J Cancer, vol. 14, 1977, p. 6-9.
14. RaghvanVM, Bailoor DN, Jhansirani P. Incidence of ABO blood Groups in oral cancer in South Karna district. J Indian Dent Assoc., vol. 58, 1986, p. 305-8.

15. Shan Gao, Erik Paul Bennett, Jesper Reibel, Xinchun Chen, Maria Elisabeth Christensen, Annelose Krogdahl, et al. Histo-blood group ABO antigen in oral potentially malignant lesions and squamous cell carcinoma-genotypic and phenotypic characterization. *APMIS*, vol. 112, 2004, p. 11-20.
16. Ravn V, Dabelsteen E. Tissue distribution of histo-blood group antigens. *APMIS*, vol. 108, 2000, p. 1-28.
17. Carey TE, Nair TS, Chern C, Libert M, Grossman HB, Wolf GT, et al. Blood group antigens and integrins as biomarkers in head and neck cancer: is aberrant tyrosine phosphorylation the cause of altered alpha 6 beta 4 integrin expression? *J Cell Biochem Suppl*, vol. 17F, 1993, p. 223-32.
18. Matsumoto H, Muramatsu H, Shimotakahara T, Yanagi M, Nishijima H, Mitani N, et al. Correlation of expression of ABH blood group carbohydrate antigens with metastatic potential in human lung carcinomas. *Cancer*, vol. 72, 1993, p. 75-81.
19. Orntoft TF. Carbohydrate changes in bladder carcinomas. *APMIS Suppl*, vol. 27, 1992, p. 181-7.
20. Dabelsteen E, Roed-Petersen B, Pindbrog JJ. Loss of epithelial blood group antigens A and B in oral premalignant lesions. *Acta Pathol Microbiol Scand [A]*, vol. 83, 1975, p. 292-300.
21. Dabelsteen E, Clausen H, Holmstrup P, Reibel J. Premalignant and malignant oral lesions are associated with changes in the glycosylation pattern of carbohydrates related to ABH blood group antigens. *APMIS*, vol. 96, 1988, p. 813-9.
22. Mandel U, Langkilde NC, Orntoft TF, Therkildsen MH, Karkov J, Reibel J, et al. Expression of histo-blood-group-A/B-gene-defined glycosyltransferases in normal and malignant epithelia: correlation with A/B-carbohydrate expression. *Int J Cancer*, vol. 52, 1992, p. 7-12.
23. Orflow I, Lianes P, Lacombe L, Dalbagni G, Reuter VE, Cordon-Cardo C. Chromosome 9 allelic losses and microsatellite alterations in human bladder tumors. *Cancer Res*, vol. 54, 1994, p. 2848-51.
24. Orflow I, Lacombe L, Pellicer I, Rabbani F, Delgado R, Zhang ZF, et al. Genotypic and phenotypic characterization of the histoblood group ABO(H) in primary bladder tumors. *Int J Cancer*, vol. 75, 1998, p. 819-24.
25. Gao S, Dabelsteen E, Reibel J, Bennett E. Genotypic characterization of histo-blood group ABO in oral squamous cell carcinoma. *J Dent Res*, vol. 81, 2002, p. B-364.
26. Jalili L, Zarabadipour M, Azmoudeh F, Esfehiani M, Tamiz P. ABO blood group distribution in patients with oral squamous cell carcinoma. *Annals of Dental Speciality*, vol. 6, no. 2, 2018, p. 149-53.
27. Biondi C, Campi C, Escovich L, Borrás SG, Racca A, Cotorruelo C. Loss of A, B and H antigens in oral cancer. *Inmunologia*, vol. 27, no. 3, 2008, p. 127-31.
28. Sharma G, Choudhary R, Bharti D. Studies showing the relationship between ABO blood groups and major types of cancers. *Asian J Exp Sci*, vol. 21, 2007, p. 129-32.
29. K Akhtar, G Mehdi, R Sherwani, L Sofi. Relationship between various cancers and ABO blood groups- A northern India experience. *The Internet Journal of Pathology*, vol. 13, no. 1, 2010, p. 1-4.
30. Hamed Mortazavi, Shima Hajian, Elnaz Fadavi, Siamak Sabour, Maryam Baharvand, Sedigheh Bakhtiari. ABO blood groups in oral cancer: A first case-control study in a defined group of Iranian patient. *APJCP*, vol. 15, 2014, p. 1415-18.