

ABO Blood Grouping and Susceptibility to Oral Cancer and Potentially Malignant Disorders

JENITA JACOBINA, K.M.K. MASTHAN, N. ARAVINDHA BABU, E. RAJESH⁴ and L. MALATHI⁵

Department Of Oral Pathology and Microbiology, Sree Balaji
Dental College & Hospital, Bharath University, Chennai.

*Corresponding author E-mail: jjjenita@yahoo.com

DOI: <http://dx.doi.org/10.13005/bpj/713>

(Received: August 15, 2015; accepted: September 20, 2015)

ABSTRACT

Oral cancer is reported to have one of the highest mortality ratios among all other malignancies. Oral cancer has a multifactorial etiology and is significantly associated with the risk factors of the individual's lifestyle, particularly chronic use of tobacco, spicy food, alcohol and smoking. The ABO blood group is said to influence the development of oral cancer. The surface of red blood cells and various epithelial cells express ABO blood group antigens. Various studies carried out in the Indian population have shown that people with blood group A have a higher predisposition for oral cancer.

Key words: Susceptibility, Oral, Cancer, particularly.

INTRODUCTION

The concept of the presence of an initial premalignant lesion/condition subsequently developing into cancer in the oral mucosa is well established. Oral cancer has a multifactorial etiology and is significantly associated with the risk factors of the individual's lifestyle, particularly chronic use of tobacco, spicy food, alcohol and smoking. In India and South East Asia, chronic use of betel quid (pan) in the mouth has been strongly associated with an increased risk for oral cancer.^{1,2,3} Genetic factors also have an influence on etiology of cancer.^{4,5,6} As the ABO blood group is recently proposed to influence the development of oral cancer, various studies are being conducted to evaluate the association between ABO blood group and oral cancer. Studies carried out in India by Tyagi et al⁷, Mittal and Gupta⁸, Nayak⁹, Baruah and Gogoi¹⁰ and Raghavan et al¹¹, have shown that people with blood group A have a predisposition for oral cancer.

Incidence of oral cancer

The various forms of cancer account for about 12% of deaths world-wide.¹² In developing countries, oral cancer is the third most common type of cancer after cervix and stomach.¹³ In India, 40% of cancers of the body are oral cancers and is thus considered a killer disease.¹⁴ Oral cancer mortality rate in India is 7.2 per 1,00,000,¹³ while the world mortality rate is 2.9 per 1,00,000.¹⁵ Oral cancer has the lowest five year survival rate of less than 50%. Diagnosing them early would reduce the morbidity as well as mortality rates.

The ABO blood groups and cancer

The ABO blood groups were first discovered by Karl Landsteiner in 1900 and a 4th group, AB was later discovered by his pupils Von Decastallo and Sturli in 1902.¹⁴ Etiology of oral cancer is life style changes along with genetic and hereditary influences. The ABO blood groups is one such genetic factor that is said to be associated

with oral cancer. The precursor antigen for the formation of A and B antigens, is the H antigen and is present in all individuals, irrespective of their blood groups. For those belonging to the A and B blood groups, the precursor H antigen is converted to A and B antigen respectively. People having O blood group have the highest amount of H antigen, which is said to offer protection against oral cancers.¹⁶

In A and B blood groups, since the precursor H antigen is converted to A and B antigens, protective effect is not seen in people with these groups. Individuals with blood group A are proposed to be at a higher risk for developing oral cancer due to the expression of an A- like antigen (Forssmann or Tn antigen). The so- called 'incompatible A expression' was detected in cancer. Cancer cells are capable of A antigen expression even in individuals with blood group B or O. Thus antibodies to A can attack precancerous and cancerous cells expressing this antigen. Individuals with blood groups A and AB lack antibodies to A and are thus more likely to develop oral cancer.¹⁸ The protective effect of blood group O on cancer development is attributed to the increased apoptosis resistance of epithelial cells presenting A and B antigens.¹⁹

The blood group antigens, in addition to being present on the RBC membranes are also found on epithelial cells of various tissues, including the oral mucosa. Tumor development is associated with a downregulation of glycosyl transferase, that

is involved in the biosynthesis of A and B antigens.¹⁷ Partial or complete deletion of epithelial blood group antigens due to aberrations in their synthesis, results in their cell surface changes. This altered antigen pattern on the cell surface is a tumor-associated change that is noted in malignancies.²⁰

The ABO blood group genes are mapped to 9q region where genetic alterations are common in most cancers²¹

ABO blood group distribution in India

The distribution of ABO blood groups vary according to different geographic areas. The most prevalent blood group among Indian population is found to be O group, followed by B, A and AB groups.²²

CONCLUSION

As studies indicate the susceptibility of A blood group to the development of oral cancer, awareness needs to be spread among the mass. Early and regular cancer screening has to be advised to patients of susceptible blood group if any known and established etiologic factor like tobacco or alcohol abuse is found. Apart from advocating lifestyle modifications, blood donation camps can be utilized as platforms wherein when blood is collected and blood group recorded, donors with susceptible blood group can be counseled and regular cancer screening planned.

REFERENCES

1. Pindborg JJ, Murti PR, Bhonsle RB, et al. Oral submucous fibrosis as a precancerous condition. *Scand J Dent Res* **92**: 224-229 (1984).
2. Murti PR, Bhonsle RB, Pindborg JJ, et al. Malignant transformation rate in oral submucous fibrosis over a 17-year period. *Community Dent Oral Epidemiol* **13**: 340-341 (1985).
3. Murti PR, Bhonsle RB, Gupta PC, et al. Etiology of oral submucous fibrosis with special reference to the role of areca nut chewing. *J Oral Pathol Med* 1995; **24**: 145-152
4. Mao L, Hong WK, Papadimitrakopoulou VA. Focus on head and neck cancer. *Cancer Cell* **4**: 311-6 (2004).
5. Jefferies S, Foulkes WD. Genetic mechanisms in squamous cell carcinoma of head and neck. *Oral Oncol* **37**: 115-26 (2005).
6. Scully C, Field JK, Tanzawa H. Genetic aberrations in oral or head and neck squamous cell carcinoma. *Oral Oncol*; **36**: 311-27 (2000).
7. Tyagi SP, Pradhan S, Agarwal P. Blood groups in malignant diseases. *J Indian Med Assoc*

- 45: 645-50 (1965).
8. Mittal VP, Gupta S. The study of ABO blood groups in oral cancer. *J Cancer* 1969;6: 34-7
 9. Nayak SK. ABO blood groups in different diseases. *J Indian Med Assoc* **57**: 449-52 (1971).
 10. Baruah BD, Gogoi BC. Blood groups in cancer in Assam, India. *Indian J Cancer* **14**: 6-9 (1977).
 11. Raghavan VM, Bailoor DN, Jhansirani P. Incidence of ABO blood groups in oral cancer in South Karna district. *J Indian Dent Assoc* **58**: 305-8 (1986).
 12. Jaleel BF, Nagarajappa R. Relationship between ABO blood groups and oral cancer. *Indian J Dent Res*; **23**: 7-12 (2012).
 13. Fazeli Z, Pourhoseingholi MA, Pourhoseingholi A, Vahedi M, Zali MR. Mortality of oral cavity cancer in Iran. *Asian Pac J Cancer Prev* **12**: 2763-6 (2011).
 14. Ananthanarayanan R. Immunohaematology, In: Textbook of Microbiology, 3rd Ed, New Delhi: Orient Longman Limited; 170-1 (1996).
 15. Jemal A, Bray F, Center MM, et al. Global cancer statistics. *CA Cancer J Clin* **61**: 69-90 (2011).
 16. Auclair CL. Altered H antigen reactivity as an indicator of malignant transformation in oral epithelium. *J Oral Pathol* **13**: 401-11 (1984).
 17. Dabelsten E, Gao S. ABO blood group antigens in oral cancer. *J Dent Res* **84**: 21-8 (2004).
 18. Hakomori S. Antigen structure and genetic basis of histo-blood groups A, B and O: their changes associated with human cancer. *Biochem Biophys Acta* 1999; **1473**(1): 247-66
 19. 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*; **12**(12): 851-6 (2002).
 20. Dabelsten E, Pindborg JJ. Loss of epithelial blood group substance in oral carcinoma. *Acta Path Microbial Scand* **81**: 435-44 (1973).
 21. Henderson J, Seagrott V and Goldacre M. Ovarian cancer and ABO blood groups. *J Epidemiol Comm Health* **47**: 287-9 (1993).
 22. Sharma G, Choudhary R and Bharti D. Studies showing the relationship between ABO blood groups and major types of cancers. *Asian J Exp Sci* **20**(1): 129-32 (2007).