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RESEARCH ARTICLE

ASSOCIATION OF ABO BLOOD GROUPS IN ORAL POTENTIALLY MALIGNANT DISORDERS AND ORAL SQUAMOUS CELL CARCINOMA

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Abstract

Background: The objective of this study was to evaluate the correlation between ABO blood group types and oral potentially malignant disorders and oral squamous cell carcinoma. According to the earlier study findings (based on available literature), an individual's susceptibility to certain cancers, such as oral squamous cell carcinoma is influenced by ABO blood type. As one third of oral squamous cell carcinomas develop from potentially malignant disorders it is imperative to identify the association between ABO blood group and these lesions.

Materials and Methods: The study was conducted in the Department of Oral Medicine and Radiology in collaboration with Department of Oral Pathology at Malla Reddy Institute of Dental Sciences, Hyderabad on 158 clinically diagnosed potentially malignant disorders and oral squamous cell carcinoma patients. Out of which 122 were males and 36 were females. Patients' ABO blood types were ascertained using the rapid slide agglutination test.

Results: The Chi square test was used to determine the statistical relationship between ABO blood types and the risk of oral cavity malignancies. In this study Incidence of Squamous cell carcinoma found to be more in A+ve blood group, Oral Submucous fibrosis more in B+ve blood group, Oral leukoplakia more in B+ve and Oral lichen planus more in O+ve blood group. A statistically significant association was observed.

Conclusion:According to this study, the A+ve blood group had a higher incidence of squamous cell carcinoma, the B+ve blood group had a higher incidence of oral submucous fibrosis, the B+ve blood group had a higher incidence of oral leukoplakia, and the O+ve blood group had a higher incidence of oral lichen planus.

Keywords: **ABO blood groups, Oral squamous cell carcinoma, Oral potentially malignant disorders**

INTRODUCTION

Oral cancer has been impacting humans for a long time. In the developed countries, after heart diseases Cancer is the second leading cause of death. In developing countries cancer is the third leading cause of death.

3 % of malignancies recorded worldwide are oral cavity cancers. In men it accounts for 6 th most common cancer and in women it is 12 th most common cause[1].

There are no reliable histological markers to predict possible malignant transformation, however up to one-third of oral potentially malignant illnesses will eventually progress to oral squamous cell carcinoma over a period of ten years.

In 2005, the WHO recommended the term "Oral Potentially Malignant Disorders" (OPMDs), which encompasses both premalignant lesions and conditions[2]. In India the prevalence of OPMDs is more because of rampant practice of deleterious habits. OPMDS have much better treatment modalities and prognosis when compared to Oral Cancer.

Oral Leukoplakia, Erythroplakia and Oral submucous Fibrosis are the major OPMDs.

The high frequency of OPMD s and OSCC in India is generally ascribed to cultural, geographic, socioeconomic, and other lifestyle factors. Very little research has been done to investigate the genetic connections between the most common OPMDs. Blood types play a vital part in the immunogenetic system. Most of the human cancers are derived from epithelial cells and ABO antigens are found on the surface of RBCs and epithelial cells. An alteration in blood group antigens is a key factor in many human cancers[3].

ABO groups are the most sensitive blood grouping system to create out of all the genetically driven blood grouping systems. The ABO group genes, which are linked to the 9q34.2 region-a location where genetic changes are frequently seen in numerous cancers—encode the antigen that causes tumors. The expression of blood group antigens may be impacted by a genetic mutation in a tumor.

Changes in cellular mobility and interactions between tumor cells and distant organ endothelial cells can result from the presence or lack of these antigens. Numerous cancers have been linked to A or B epitope deficiencies[4].

Following the discovery by Arid and Bentall (1953) that blood group "A" was linked to stomach cancer, other investigators have looked at the possible correlation between blood groups and a number of illnesses[5]. The purpose of the current study was to evaluate the association between the incidence of oral squamous cell carcinoma (OSCC) and potentially malignant disorders (OPMDs) and ABO and Rh blood types.

MATERIALS AND METHODS

Study population: The current study was conducted at Malla Reddy Institute of Dental Sciences, Hyderabad after obtaining institutional ethical committee approval. An informed consent has been taken from all the participants.

According to the world health organization guidelines for diagnosing oral mucosal lesions[3], 30 leukoplakia, 57 Oral Submucous Fibrosis, 28 oral lichen planus, 43 oral squamous cell carcinoma subjects were selected for the study.

Detailed case history was taken from all the subjects and Blood group was determined using a blood group kit with the Rapid Slide agglutination test by the department of oral pathology. To minimize inter-examiner variability, calibration was done. After carefully washing their mouths with water, the patients were inspected under an incandescent light source. Lesion characteristics, anatomical position, extent, possible etiological or associated factors, dental status, and habits like alcohol and tobacco use were evaluated throughout the examination. Furthermore, in cases requiring additional evaluation, biopsies were conducted to obtain a definitive diagnosis. Estimation of blood group was done using blood group kit which contained antiserum A, antiserum B and antiserum D. The blood group was determined based on the presence of agglutination.

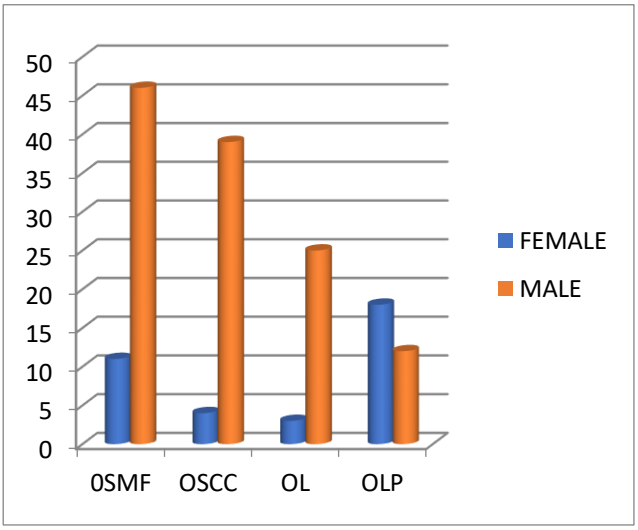
Results

Data was analyzed using SPSS software version. Descriptive statistics to summarize the data and chi square test were done to find the association between ABO Rh blood group and oral potentially malignant disorders. A total of 158 patients with oral potentially malignant disorders and oral squamous cell carcinoma were recorded during the study period of 2 years.

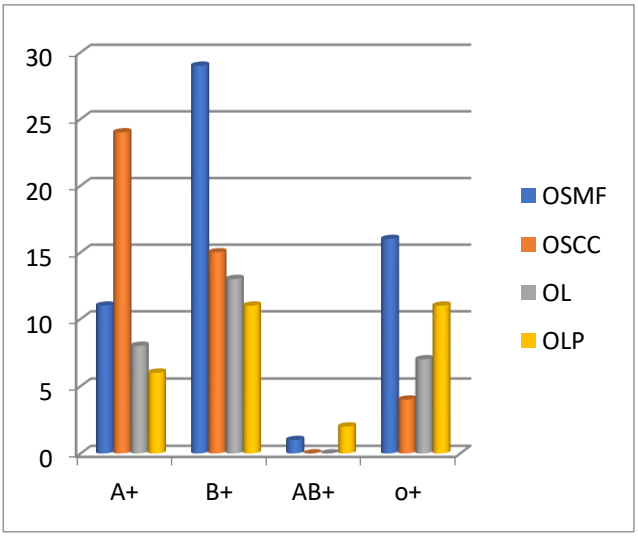
Out of which 122 (77.21%) were males and 36 (22.78%) were females (Graph 1). Number of females

was more in oral lichen planus than males. Number of males was more in oral sub mucous fibrosis, oral leukoplakia and oral squamous cell carcinoma.

57 out of 158 were diagnosed with oral submucous fibrosis, 43out of 158 were diagnosed with oral squamous cell carcinoma, 28 out of 158 were diagnosed with oral leukoplakia and 30 out of 158 were diagnosed with oral lichen planus (Graph 2).



Graph 1. Gender distribution among different potentially malignant disorders and squamous cell carcinoma



Graph 2. Distribution of A, B, AB, O blood groups in different potentially malignant disorders and squamous cell carcinoma

29 (50.9%) patients with blood group B+ found out of 57 patients of OSMF which is statistically significant. 23(53.5%) patients with blood group A+ were detected out of 43 OSCC cases which is statically significant. 13(46.4%) patients with blood group B+ detected out of 28 oral leukoplakia patients. 11(36.7%) patients with blood group O+ were detected out of 30 OLP cases which is statically significant.(Table1, 2).

Table 1. shows the prevalence of Squamous cell carcinoma and other Potentially malignant disorders

			Squamous cell carcinoma	Potentially malignant disorders			Total
				Oral submucous fibrosis	Oral leukoplakia	Oral Lichen Planus	
Blood groups	A +VE	Count	23	10	7	5	45
		% of Total	14.6%	6.3%	4.4%	3.2%	28.5%
	B +VE	Count	15	29	13	10	67
		% of Total	9.5%	18.4%	8.2%	6.3%	42.4%
	AB +VE	Count	0	1	0	1	2
		% of Total	0.0%	0.6%	0.0%	0.6%	1.3%
	O +VE	Count	4	16	7	11	38
		% of Total	2.5%	10.1%	4.4%	7.0%	24.1%
	A-VE	Count	1	1	1	1	4
		% of Total	0.6%	0.6%	0.6%	0.6%	2.5%
	B-VE	Count	0	0	0	1	1
		% of Total	0.0%	0.0%	0.0%	0.6%	0.6%
	AB-VE	Count	0	0	0	1	1
		% of Total	0.0%	0.0%	0.0%	0.6%	0.6%
Total		Count	43	57	28	30	158
		% of Total	27.2%	36.1%	17.7%	19.0%	100.0%

Table 2. The association between different blood groups and squamous cell carcinoma and other potentially malignant disorders Chi-Square Tests

	Value	df	Sig. (2-sided)
Pearson Chi-Square	32.812[a]	18	.018
No of Cases	158		

P<0.05 statistically significant

In this study, incidence of Oral Submucous fibrosis was more in B+ve blood group, Squamous cell carcinoma more in A+ve blood group, Oral leukoplakia in B+ve and Oral lichen planus more in O+ve blood group. A significant association was observed. All the associations were statistically significant with the p value at (0.018 which is less than 0.05)

The incidence and fatality rates of oral cancer have dramatically grown during the last few decades. Approximately 270,000 new cases of oral cavity cancer are reported worldwide each year, accounting for around 3% of all cancers [1]. Since Arid and Bentall's discovery in 1953 of a link between stomach cancer and blood group "A," numerous studies have explored the potential relationship between blood groups and various diseases. People with blood group A were 1.46 times more likely to acquire oral cancer than people with other blood groups, according to a study done on 235 patients with the disease[5]. Similarly, in the current study, the prevalence of oral squamous cell carcinoma is higher in individuals with blood group A+ve.

In the present study the incidence of OSMF increased between the age groups of 20-40,which is similar to the study conducted by Srivastava R et al for 2 years duration in 2016[6]. This could be linked to the enhanced social interactions and economic independence that people enjoy at this age in a quickly expanding country like India. During this stage, individuals may engage in many dangerous behaviours such as chewing betel nut, gutkha, pan masala, smoking, and alcohol consumption—either for stress relief, as a fashion trend, or due to peer pressure.

E Dabelsteen et al showed an increased incidence of numerous types of carcinomas in patients with blood groups A and B[7]. Similar to the findings in the studies mentioned above, the present study suggests that certain blood groups may have a higher likelihood of developing premalignancies that could subsequently progress into malignancies. Blood group antigens are found not just on the surface of red blood cells, but also on epithelial cells in many tissues, including the oral mucosa.

The downregulation of glycosyltransferases involved in the production of A and B antigens has been linked to tumor growth[8].

The ABO blood group genes are found on the 9q chromosome, which is known to be a hotspot for genetic mutations in many cancers[9]. More than 80% of instances there was a reduction in the expression of A and B antigens in oral squamous cell carcinoma. These results were also reported in potentially malignant disorders with epithelial dysplasia[10]. The Thomsen-Friedenreich (T) antigen, a tumor marker, is expressed on many malignant cells but is repressed in normal cells. The Tn antigen, a precursor to the T antigen, is not inhibited as cells become malignant. There is also a structural similarity between these two antigens and antigen A[11]. Due to this structural similarity, individuals with blood group A exhibit a lower immunologic response to T and Tn antigens. This reduced immune recognition may allow cancer cells to evade detection and bypass the immune system, facilitating tumor progression[12].

Cancer patients with blood group A exhibit a consistent suppression of Tn antigens, regardless of age, cancer stage, or tumor morphology, along with lower levels of anti-B isohemagglutinins. This phenomenon may help explain the poorer outcomes observed in many cancers among individuals with blood group A, as their immune response is less effective in recognizing and combating tumor cells[11]

When a cancer cell loses blood group antigens, it loses its cohesiveness, gaining the ability to circulate throughout the body. In addition, these cells often lose the expression of several cell adhesion proteins, such as integrins, which normally express A-like antigens on their receptors and regulate cell movement. This loss of adhesion molecules facilitates tumor spread and metastasis[13].

In a study conducted by Bhateja s reported that prevalence of oral leukoplakia was high in blood group A but in the present study high prevalence of oral leukoplakia is found in blood group B[14].

People with blood group A were more prone to the mucosal phenotype of lichen planus (LP), according to a 2016 study by Shahidi-Dadras M. However, the O blood group has a higher prevalence of lichenplanus in the current study[15].

Gopal Reddy V K conducted a study on the association of OSMF and ABO blood grouping revealed that people with blood group A were at higher risk of developing OSMF in comparison to others in contrary to this the present study showed high prevalence rate in individuals with blood group B[16].

Very few studies conducted on the association of ABO blood grouping and premalignant lesions and conditions, they have failed to provide a unifying and testable hypothesis. It can just be the outcome of a person's lifestyle, environment, diet, tobacco, smoking, and alcohol use, as well as population history. When predicting cancer risk factors, variables such as blood group distribution by race and ethnicity are important. The current study provides some insight into the patterns of oral precancer incidence. The current study highlights the need of considering blood group type in conjunction with other risk factors for oral squamous cell carcinoma and other potentially malignant illnesses.

Conclusion:

The study highlights a noteworthy correlation between ABO blood groups and the risk of developing oral cancer and other potentially

malignant oral conditions. Individuals with blood group A appear to be at a higher risk of oral cancers, likely due to their lower immunologic response to tumor-associated antigens such as T and Tn. Additionally, this study observed a correlation between blood group B and conditions like oral sub mucous fibrosis and lichen planus, diverging from some previous studies. The loss or reduction of A and B antigens in cancer cells
suggests a potential mechanism by which tumor cells enhance their mobility and metastatic potential, due to the loss of cell adhesion properties. While this association may be influenced by lifestyle, environmental factors, and genetic predisposition, blood group analysis could be considered as part of a broader risk assessment for oral precancerous and cancerous conditions, especially when combined with other known risk factors.

DECLARATIONS

Conflicts of interest and financial disclosures

The author declares that he has no conflict percent and there was no external source of funding for the research in question.

Ethical approval

The study was approved by the Institutional Ethics Committee and was conducted in accordance with the Declaration of the World Medical Association.

Informed consent

Informed consent was obtained from all individual participants included in the study.

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The work was not funded.

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