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Original Research Article

Correlation of ABO blood group phenotype with atrophic rhinitis: an observational study

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ABSTRACT

Background: Atrophic rhinitis is very common in India. All etiological factors are yet unknown. Many studies have been conducted to find the relationship between ABO blood group and various systemic diseases but limited number of studies has been conducted to determine the association of ABO blood group with atrophic rhinitis. The present study therefore was performed to see the association between atrophic rhinitis and ABO blood group.
Methods: 100 patients of both genders clinically diagnosed with atrophic rhinitis were included in this study. Patients with nasal obstruction, nasal discharge and foul smelling from causes other than the atrophic rhinitis were excluded from the study.
Results: Maximum number of cases 27 (27%) were between 21-30 years of age. The most common presenting symptom in our study was foul smell from nose in 100 cases (100%). Foetors, crusts and roomy nasal cavity were seen in majority of cases. Commonest organism identified in this study was *Pseudomonas aeruginosa* 37% followed by *Klebsiella* (31%). Out of 100 patients, 42 patients belonged to group O, 40 patients belonged to group B, 14 patients belonged to group A and only 4 patients belonged to group AB. Control population with blood group B comprises the maximum number of cases followed by blood group O. Percentage of patients with blood group O is higher in atrophic rhinitis as compared with control and the percentage of patients with blood group B is slightly higher in atrophic rhinitis as compared with control.
Conclusions: Our study concluded that no correlation exists between the ABO blood group and atrophic rhinitis.

Keywords: Aetiology, Atrophic, Blood group, Ozaena, Rhinitis

INTRODUCTION

Atrophic rhinitis was known since the time of ancient Egypt, almost 4000 years ago and descriptions of it are found in the historical medical papyri. The ancient Greek and Indian civilizations were aware of this disease.[1] Atrophic rhinitis was described by Dr. Bernhard Fraenkel in the latter part of the nineteenth century as a chronic nasal disease, characterized by a triad of fetor, crusting and atrophy of nasal structures.[1] Primary atrophic rhinitis is also called Ozaena, which means stench in Greek.[2] Dr. Spencer Watson called it Ozaena in 1875.

Its prevalence varies in different parts of the world. It is a common condition in tropical countries like India, Pakistan, China, Malaysia, Saudi Arabiya and Egypt.[3,4] The reported prevalence of primary atrophic rhinitis ranges from 0.3% to 1.0% of the population in countries with high prevalence.[5] Atrophic rhinitis is a chronic inflammation of nose characterized by atrophy of nasal mucosa, nasal glands, turbinates and the nerve elements supplying the nose. The nasal cavity is roomy and full of foul smelling crusts. The condition is predominantly seen in young and middle aged females (F:M=5.6:1).[6] Atrophic rhinitis can be classified into primary and

secondary type. The cause of primary atrophic rhinitis is unknown and unspecified. The diagnosis of primary atrophic rhinitis is essentially clinical and exclusion of other conditions causing secondary atrophic changes. Various theories and hypothesis have been proposed for the aetiology of primary atrophic rhinitis like chronic infection of the nose and paranasal sinuses by *Klebsiella ozaena*, *Pseudomonas aeruginosa*, *Diphtheroids*, *Proteus vulgaris*, *E. coli*, etc.[6] Nutritional deficiency of iron, vitamins A and D and proteins, lower socioeconomic status, poor hygiene, hormonal, hereditary and autoimmune theories have also been proposed.[7-10] Secondary atrophic rhinitis may be secondary to a number of conditions. Chronic granulomatous diseases like syphilis, lupus, leprosy and rhinoscleroma may cause destruction of the nasal structures and secondary atrophic changes. Secondary atrophic rhinitis can also result from long-standing purulent sinusitis, radiotherapy of the nose or paranasal sinuses and excessive surgical removal of turbinates.[1] It can also result from maxillofacial and nasal trauma.

The nasal cavities become roomy and are filled with foul smelling crusts which are black or dark green and dry. Microorganisms are known to multiply and produce a foul smell from the nose, though the patients may not be aware of this. This is called merciful anosmia. Patients usually complain of nasal obstruction despite the roomy nasal cavity, which can be caused either by the obstruction produced by the crusts in the nose, or as a result of sensory loss due to atrophy of nerves in the nose, so the patient is unaware of the air flow. Bleeding from the nose, also called epistaxis, may occur when the dried crusts are removed. Septal perforation and dermatitis of nasal vestibule can occur. The nose may show a saddle-nose deformity. Atrophic rhinitis may also be associated with similar atrophic changes in the pharynx or larynx, producing symptoms pertaining to these structures. Hearing impairment can occur due to Eustachian tube blockage causing middle ear effusion. Permanent loss of smell and impairment of taste may also be a result of this disease, even after the symptoms are cured. The offensive order not noticed by patient due to loss of smell and sensitivity in the nose and flies comfortably lay eggs on crust in nasal chamber which results in maggot nose (nasal myiasis), which is a very painful condition. It is known as peenash in India. The disease is unpleasant, distressing and antisocial and it makes patients life miserable. Nasal myiasis primarily affects the underprivileged low socioeconomic class, destitute, orphans and the neglected.

There are various theories on etiology so the various methods of treatment. Both medical and surgical treatments have been advocated, each with its own limitations and degree of success. Various methods of treatment are nasal irrigation, alkaline nasal douching. glucose–glycerine nose drops, liquid paraffin nose drops, antibiotics and antimicrobials, oestradiol spray, oral potassium iodide, kemicetene antiozaena solution, chloramphenicol drops, placental extract injections, Iron, zinc, protein and vitamin (A and D),Supplements Prostheses, Young's operation, modified Young's operation, submucosal injection of Teflon paste, medial displacement of lateral nasal wall, Wittmack's operation, Raghav Sharan's operation and repeated stellate ganglion block etc.[12,13] Use of decongestant and steroid is strongly contraindicated in atrophic rhinitis as they worsen the pathology and hence the clinical course of the disease.

There are 34 blood group systems, each with their characteristic antigens.[14] ABO system is discovered by Landsteiner and Weiner.[15] ABO system is one of the most commonly used, clinically significant, and vastly studied systems. The phenotype of ABO is determined by ABO gene which is located on the long arm of chromosome 9. Along with their expression on red blood cells, ABO antigens are also highly expressed on the surface of a variety of human cells and tissues, including the epithelium, platelets, sensory neurons and the vascular endothelium.[16] The clinical importance of the ABO blood group system extends beyond transfusion medicine and immune haematology. Historically, the ABO phenotype was one of the first markers involved in cancer susceptibility.[17] Several studies have suggested an important role in the development of infectious, cardiovascular, oncological, and other diseases.[18,19] Peptic ulcer has been reported to be more prevalent in individuals with blood group O while gastric cancer is more in those with blood group A.[20]

Possible association between cardiovascular diseases and ABO blood group has been pointed out by several studies. A Japanese study investigated the association between blood groups and life expectancy.[21] The ABO blood group system is one of the genetic risk factors linked to the susceptibility to asthma in some populations.[22] A study claims that there is a significant relationship between a specific blood group and susceptibility to allergic rhinitis.[23] A study reported that most blood group antigens play crucial roles in cell-cell recognition and in self-declaration mechanisms by functioning as receptors or surface markers.[24] Therefore, these antigens may behave as potential receptors for microorganisms or substances such as toxins or allergens that could influence the susceptibility of individuals to diseases.[25] Many studies have failed to show any significant relationship between the blood groups and diseases. Yet in some cases the associations have been established beyond dispute. Atrophic rhinitis is very common in India. All etiological factors are yet unknown.

Many studies have been conducted to find the relationship between ABO blood group and various systemic diseases but limited number of studies have been conducted to determine the association of ABO blood group with atrophic rhinitis. The present work has therefore been taken up to find out the relationship of ABO blood group with atrophic rhinitis.

METHODS

This prospective observational study was carried out in the department of otorhinolaryngology, Santosh Medical College and Hospitals, Ghaziabad over a period of two years. A total of 100 cases clinically diagnosed as atrophic rhinitis were participated in this study. Patients who gave written and informed consent were included in this study. The study protocol was approved by Institute Ethical committee.

Inclusion criteria

Patients of both genders clinically diagnosed with atrophic rhinitis were included in this study.

Exclusion criteria

Patients with nasal obstruction, nasal discharge and foul smelling from causes other than the atrophic rhinitis were excluded from the study.

A detailed clinical history was taken and a note was made regarding age, sex, religion, profession, family history of atrophic rhinitis, nutrition, symptoms and duration of symptoms. Careful examination of the ear, nose, nasopharynx, oral cavity, oropharynx and neck was done in all cases. Nasal endoscopy was done by rigid, 4 mm, 0 0 Hopkin's rod in every case. The blood grouping of control cases as well as cases of atrophic rhinitis under study has been done in the department of blood bank of Santosh medical college, Ghaziabad. Routine investigations (TLC, DLC, ESR, Hb%) and blood biochemistry for urea, sugar, cholesterol, SGPT, SGOT and thyroid function test were done in all patients. Microbiological analysis from nasal swab was done in all cases. Radiological investigations like x-ray of nose, paranasal sinuses, CT Scan of PNS head and neck were done wherever necessary. Fine needle aspiration cytology and biopsy for histopathology wherever necessary were done. Data was collected using proforma and data collected included patients demographics. Data obtained underwent standard statistical analysis. SPSS (statistical Packages for the Social Sciences) program was used for data analysis. The p value <0.05 was considered significant.

RESULTS

The present study was done on 100 cases of atrophic rhinitis in the department of otorhinolaryngology, Santosh medical college and Hospitals, Ghaziabad during the period 2015 to 2017.

Out of the 100 cases studied, 23 cases were males and 77 cases females. Male to female ratio was 1:3.35. Table 1 shows that females are more often affected than males and also show maximum number in between 21-30 years of age group.

Table 1: Sex distribution of patients.

Age in years	Males	Females	No. of patients
0-10	2	3	5
11-20	8	15	23
21-30	3	24	27
31-40	4	21	25
41-50	4	6	10
51-60	2	4	6
61-70	0	4	4
71-80	0	0	0
Total	23	77	100

Patients mean age at presentation in present study was 29.67±14.10 (SD) years. In the present study, it was observed that maximum number of cases 27(27%) were between 21-30 years of age. Next common age group involved was between 31-40 years (25 cases 25%). Only four cases were found to be above 60 years. Lowest age recorded was 6 years of age and highest 68 years of age. Figure 1 shows that the atrophic rhinitis commences at adolescent and adults. Figure 1 is showing age distribution of patients.

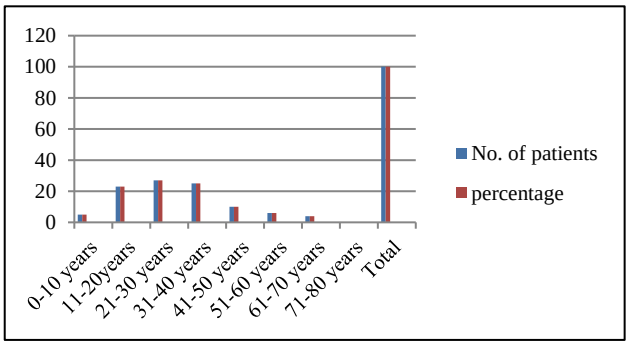

Figure 1: Age distribution of patients.

According to Kuppuswamy's scale, patients were divided in three groups, upper, middle and lower class. It is observed that maximum numbers of patients (80%) with atrophic rhinitis were having low socio-economic status and only 2% cases were belonging to rich socio-economic class. Table 2 is showing incidence of atrophic rhinitis in different socio-economic class.

Table 2: Atrophic rhinitis in different socio-economic class.

Socioeconomic class	No. of cases	Percentage
Upper	2	2.0%
Middle	18	18.0%
Lower	80	80.0%

The most common presenting symptom in our study was foul smell from nose in 100 cases (100%). Nasal crusting was seen in 99 cases (99%), anosmia in 92 cases (92%), dryness of nose in 69% cases and nasal obstruction in

51% of cases. Table 3 is showing symptoms in patients with atrophic rhinitis.

Table 3: Various symptoms noted in atrophic rhinitis patients.

Symptoms	No. of patients	Percentage
Foul smell from nose	100	100
Nasal crusting	99	99
Anosmia	92	92
Cacosmia	8	8
Nasal obstruction	51	51
Headache	31	31
Epistaxis	31	31
Nasal discharge	11	11
Dryness of nose	69	69
Maggots nose	30	30
Foreign body sensation in nose	33	33

Foetors, crusts, roomy nasal cavity, atrophy of turbinates, pale and ulcerated nasal mucosa were seen in majority of cases. In twenty-two cases nasal bridge were found depressed. Out of 100 cases, 9 cases were associated with maxillary sinusitis and one was associated with the frontal sinusitis. Perforation of hard palate was observed in two cases and perforation of nasal septum was found in one case. Table 4 is showing signs in patients with atrophic rhinitis.

Table 4: Various signs noted in atrophic rhinitis patients.

Clinical findings	No. of patients	Percentage
Foetor	100	100
Crust	99	99
Roomy nasal cavity	97	97
Atrophy of turbinates		
Inferior	100	100
Middle	80	80
Depressed nasal bridge	22	22
Deviated nasal septum	35	35
Pale nasal mucosa	69	69
Ulceration nasal mucosa	31	31
Sinusitis		
Maxillary	9	9
Frontal	1	1
Atrophic pharyngitis	8	8
Atrophic laryngitis	2	2
Perforation roof of nose	1	1
Perforation palate	2	2
Perforation septum	1	1
Cellulitis of nose and face	5	5

71 cases (71%) out of 100 cases studied had a haemoglobin level of less than 11 gm% while 29 cases (29%) had haemoglobin of more than 11gm%. Table 5 is showing haemoglobin level.

Table 5: Haemoglobin level in atrophic rhinitis patients.

Haemoglobin	No. of cases	Percentage
5-8 gm%	10	10.0%
8.1-11 gm%	61	61.0%
11.1-16 gm%	29	29.0%

98% of nasal swab showed growth. Commonest organism identified in this study was *Pseudomonas aeruginosa* 37% followed by *Klebsiella* (31%), *Staphylococcus aureus* (6%), *E. coli* (5%) and *Proteus* (4%). In 13% cases more than one organism was isolated. 2% of the nasal swab showed a sterile culture after 72 hours. Table 6 is showing bacterial isolates in cases of atrophic rhinitis.

Table 6: Microbiological organisms isolated from nasal swab in cases of atrophic rhinitis.

Microorganisms	No. of cases	Percentage
Klebsiella	31	31.0%
Pseudomonas aeruginosa	37	37%
Staphylococcus	6	6.0%
E. coli	5	5.0%
Proteus mirabilis	4	4.0%
Neisseria	2	2.0%
More than one organisms	13	13.0%
No growth	2	2.0%

Table 7: Prevalence of ABO blood groups in control population and in atrophic rhinitis patients.

Blood group	O	A	B	AB	Total
Control	600	540	660	200	2000
Cases of atrophic rhinitis	42	14	40	04	100

Cases of atrophic rhinitis diagnosed clinically were studied and blood group determination was done as a routine in these cases to assess the prevalence of the different blood group in cases of atrophic rhinitis. Out of 100 patients, 42 patients belonged to group O, 40 patients belonged to group B, 14 patients belonged to group A and only 4 patients belonged to group AB. The prevalence thus obtained has been compared with normal distribution of different blood group in and around Ghaziabad on a population of 2000. The data regarding control group was collected from the department of blood bank of Santosh Medical College and Hospitals. Control population with group B comprises the maximum number of cases. Control population with blood group O coming next. In case of Atrophic rhinitis on the other hand, group O was found to be most prevalent, it was followed by

blood group B then A and AB. The result thus obtained has been shown in the Table 7.

Percentage of patients with blood group O was higher in atrophic rhinitis as compared with control and the percentage of patients with blood group B was slightly higher in atrophic rhinitis as compared with control which was not found to be statistically significant ($p>0.05$) Percentage of patients with blood group A was lower as compared with control which was found to be statistically significant ($p<0.05$). Groups were compared using Chi-square test and P-value less than 0.05 ($p<0.05$) considered statistically significant. Table 8 is showing Percentage distribution of ABO blood group in control and atrophic rhinitis patients.

Table 8: Percentage distribution of ABO blood group in control and atrophic rhinitis patients.

Blood group	O	A	B	AB
Control	30	27	33	10
Cases of atrophic rhinitis	42	14	40	04
P value	p=0.07	p=0.02	p=0.3	p=0.09

DISCUSSION

Out of the 100 cases studied, 23 cases were males and 77 cases females with male to female ratio of 1:3.35. We observed that the incidence was more in females and maximum number of cases in between 11 to 40 years of age. In a study by Bist et al female to male ratio was 2.5:1 and in the study by Bunnag C et al, it was 5.6:1.[6,26] Mishra et al in their study observed slightly higher incidence in females with male to female ratio of 1:1.5.[27] Atrophic rhinitis is more predominant in females is a well-established fact.

Majority of the patients in this study were in the age group 21 to 30 years (27 cases, 27%) followed by 31 years to 40 years (25 cases, 25%). Only four cases were found to be above 60 years. Lowest age recorded was 6 years of age and highest 68 years of age. The study is similar to that of Han-Sen, who observed most common age group as 21-30 years.[28] In a study by Mishra et al, maximum number of cases was in the age group 21-30 years (40%).[27] The present observations also correlate with the study of Shreedharan et al, and Jain et al.[29,30]

In the present study, according to Kuppuswamy's scale, it is found that majority of patients (80%) of atrophic rhinitis belong to low socioeconomic groups. This observation is similar to Jain et al, who reported that atrophic rhinitis is a rare disease in the developed world and quite common in developing country in patient of lower socioeconomic groups.[30] In a study by Bist et al, low socioeconomic class comprised of 72.2% cases and 27.8% were from middle class while none from upper class.[26]

In our study foul smelling from nose felt by others (100%) and falling of crusts (99%) were the most common symptoms. The next common complaints were loss of sense of smell in 92 patients (92%), dryness of nose in 69 patients (69%) and nasal obstruction in 51 patients (51%). The other symptoms were bleeding from the nose in 31 patients (31%), headache in 31 patients (31%) and maggots in nose in 30 patients (30%). According to study done by Gadre et al, crusting and foul smelling nasal discharge were present in all patients (100%).[31] According to study done by Kameswaran et al, anosmia (100%) and nasal discharge (95%) were the commonest symptoms followed by epistaxis and septal perforation.[32]

In our study the most common clinical findings were foetor in 100 patients (100%) and atrophic turbinates in all 100 patients (100%). The next common signs were roomy nasal cavity in 97 patients (97%) and atrophy of middle turbinate in 80 patients (80%).The other findings were pale nasal mucosa in 69 patients, deviated nasal septum in 35 patients, ulcerated mucosa in 31 patients and depressed nasal bridge in 22 patients. According to Gadre et al, the most common signs were roomy nasal cavity, nasal crusting, and turbinate atrophy.[31] Similar findings were observed in this study.

71 cases (71%) out of 100 cases studied had a haemoglobin level of less than 11 gm% while 29 cases (29%) had haemoglobin of more than 11gm%. Similar findings were observed by Bernat et al, who considered atrophic rhinitis an iron deficiency disease.[7]

Commonest organism identified in this study was *Pseudomonas aeruginosa* 37% followed by *Klebsiella* (31%), *Staphylococcus aureus* (6%), *E. coli* (5%) and *Proteus* (4%). In 13% cases more than one organism was isolated. 2% of the nasal swab showed a sterile culture after 72 hours. Bist et al also found *Pseudomonas* as the most common isolate in 37% cases.[26] Bunnag et al and Moore et al, however found *Klebsiella* as the commonest growth.[6,11] In present study, contrary to the other studies pseudomonas was the commonest organism isolated from nasal swab followed by *Klebsiella* species.

In recent few years, work has been done regarding association of different blood group with various diseases like pancreatic cancer, gastric carcinoma, peptic ulcer, tendon rupture, myocardial infarction, angina pectoris etc. It is an established fact that the difference of blood group pattern in human being implies the presence or absence of definite chemical substance not only in the red cells but most of tissue cells particularly the epithelial cells. It is therefore possible that person of different blood groups having difference in chemical constituent of their epithelium have different susceptibility or resistance to disease.

Cases of atrophic rhinitis diagnosed clinically were studied and blood group determination was done as a

routine in these cases to determine the prevalence of ABO blood group in patients of atrophic rhinitis. Out of 100 patients, 42 patients belonged to group O, 40 patients belonged to group B, 14 patients belonged to group A and only 4 patients belonged to group AB. The prevalence thus obtained has been compared with normal distribution of different blood group in and around Ghaziabad on a population of 2000. Control population with blood group B comprises the maximum number of cases followed by blood group O. Percentage of patients with blood group O is higher in atrophic rhinitis as compared with control and the percentage of patients with blood group B is slightly higher in atrophic rhinitis as compared with control which is not found to be statistically significant ($p>0.05$). However, the number of patients of atrophic rhinitis in present study was less in comparison with the control group. In a study done by De, blood group O and B person are more commonly affected by the disease.[33] The present observations correlate with the study of De.[33] In a study done by Hilal et al, blood grouping of the patient show distribution of the disease among most of the groups in percentage near that of their distribution of the general population.[34] It is certainly desirable that the relationship between the ABO blood group and atrophic rhinitis should be further explored.

CONCLUSION

In conclusion, our results suggest that the most of the patients of atrophic rhinitis belong to blood group O followed by blood group B. No correlation exists between the ABO blood group and atrophic rhinitis. The results of this study must be considered as preliminary. Further studies with larger sample size and different population needed to establish the association between ABO blood group and atrophic rhinitis.

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