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RESEARCH ARTICLE

Current Pattern of Nasal Atrophy in North India

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ABSTRACT

Background: Classical atrophic rhinitis is rarely seen today as its mild counterpart is encountered. The aim is to assess the current clinicopathological scenario of atrophic rhinitis (AR)/rhinitis sicca (RS) along with their changing pattern of presentation in patients presenting with nasal dryness.

Material and Methods: This prospective study analysed 100 patients of nasal dryness after categorizing them into 2 groups, with group-1 comprising AR/RS while group-2 comprised the rest. The age distribution, symptomatology, intranasal atrophy (intranasal dimensions using predefined calibrated probes and radiological assessment of 2-dimentional radiolucent area), bacteriological and mycological profiles were compared and analysed.

Results: AR and RS were diagnosed in 22 & 15% of cases, respectively. The female has predominated while seasonal variation in group-1 showed significance, with maximum (40%) incidence occurring post-monsoon (July-August). Group-1 revealed more severe symptoms (statistically significant) and exclusive presence of anosmia and maggots. The haemoglobin level, intranasal and radiological dimensions were also statistically significant between 2 groups. Klebsiella ozaenae was the most common bacteria encountered in group-1, while Staphylococcus aureus was encountered in group-2. Similarly, Candida was the most common fungus of group-1.

Conclusion: A high degree of suspicion is needed to diagnose AR/RS, considering the milder shade of disease prevalent today. The current pattern needs to be considered in formulating the treatment protocol and the measurement of intranasal dimensions is likely to provide a prognostic parameter.

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Primary atrophic rhinitis (AR) is well known to classically present with nasal dryness, nasal obstruction due to greenish crusts, foetid odour and possibly epistaxis. This was relatively common in India a few decades ago[1] and while complications were not uncommon, the incidence of dreaded complications such as nasal miasis had started decreasing. However, Nasal miasis was more common during the pre-antibiotic era. The patients are usually from a poor socio-economic background, often malnourished with poor hygiene. The ongoing ozaena compromises their quality of life and possibly makes them social recluse. The progressive mucosal atrophy and bony (turbinate) resorption led to a wide roomy nasal cavity with decreased nasal clearance,

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mucosal blanket and local defence mechanisms. The underlying tissue necrosis further contributes to thick crusting that, if detached, may lead to epistaxis. It is still debatable if associated bacterial infection is a secondary phenomenon or a primary event, but current evidences suggest that antibiotics are an important treatment modality for reducing clinical morbidity. However, in recent years, full blown advanced AR has become quite uncommon globally but is still seen only in few tropical countries. In general, the AR of today is comparatively a milder disease with rare presentation of profuse epistaxis and extremely rare presentation of nasal maggots. In this context a more commonly seen entity is rhinitis sicca (RS) or a mild anterior atrophic rhinitis that fails to progress to full blown AR. AR and RS both produce nasal dryness and compromise the quality of life. In addition, current patients presenting with nasal dryness have atypical AR or RS. This paper attempts to highlight the current incidence of AR/ RS among all those presenting with nasal dryness and further elaborates the current pattern of AR/ RS in this post-antibiotic era.

MATERIAL AND METHOD

This prospective study was carried out on serial 100 patients who presented with primary complaints of significant nasal dryness in the outpatient department of otorhinolaryngology at University hospital of North India. The study was undertaken after obtaining proper ethical approval from IRB. Apart from demographics and routine anamnesis a thorough examination and routine haematology was carried out. Two intranasal distances *viz.* inferior turbinate to septum (IT-S) and middle turbinate to septum (MT-S) were measured using predefined probes measuring 1 to 4 mm (figure 1). Plain radiography (Caldwel & Walters views) was undertaken to firstly assess the distance between lateral wall and septum and secondly to assess 2-dimentional patent nasal area using a superimposed 'graph-grid' bearing 1*1 mm^2 squares. Furthermore, microbiological assessment was undertaken as per the usual protocol to define bacteriology and mycology. The respective management thereafter is not included in this paper. For a meaningful comparison the recruited patients were categorised in 2 groups. Those patients diagnosed as AR (wide roomy bilateral nasal cavities anteroposteriorly) or RS (wide anterior nasal cavity) were jointly clubbed in Group-1, while Group-2 includes the rest all other cases of nasal dryness with non-classical/ minimal/ absent atrophy. The age distribution of these groups was compared while the symptomatology, intranasal atrophy, bacteriological and mycological profiles were analysed. The respective data was analysed using chi-square, Fisher-exact and t-tests, where a *p-value* of <0.05 was taken as significant. SPSS statistical software (version 21) was used for analysis.

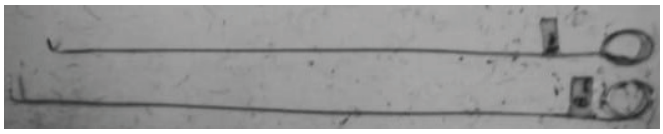

Figure 1: Customised calibrated probes used to measure intranasal dimensions (1mm & 2mm)

RESULTS

In the entire cohort of 100 patients AR was diagnosed in 22, while RS was diagnosed in 15 cases. Although female predominance was seen in group-1, but female: male ratio was more marked in AR (6:5) than RS (3:2). The age distribution of both groups is depicted in figure 2. It is important to note that peaks of the curves do coincide up to a certain extent and the shape of curve is almost similar. The ethnicity, religion or habitat (rural/urban) did not show any significant difference. However, a seasonal trend was appreciated

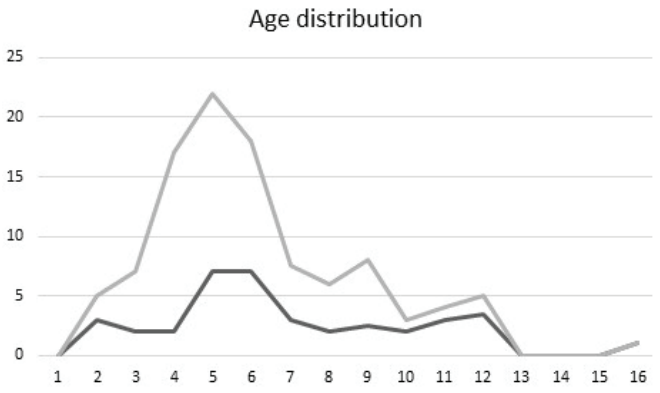

Figure 2: Age distribution
Dark curve denotes group 1 while lighter curve denotes group 2. Y-axis denotes number of patients and X-axis their respective age (1: 0-5y, 2: 6-10y, 3: 11-15y, 4: 16-20y, 5: 21-25y, 6: 26-30y, 7: 31-35y, 8: 36-40y, 9: 41-45y, 10: 46-50y, 11: 51-55y, 12: 56-60y, 13: 61-65y, 14: 66-70, 15: 71-75, 16: 76-80y)

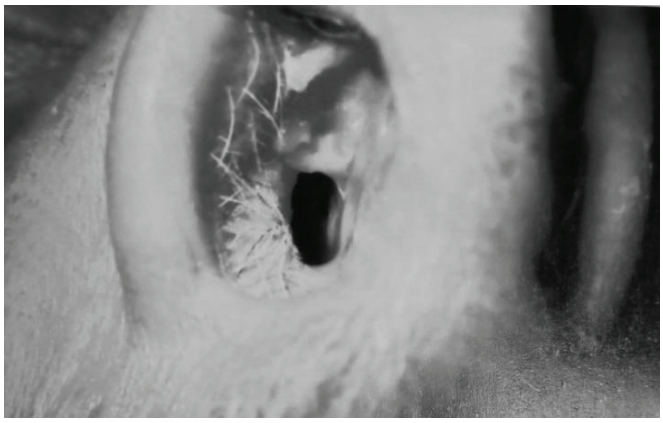

Figure 3: Nasal crusting with maggot

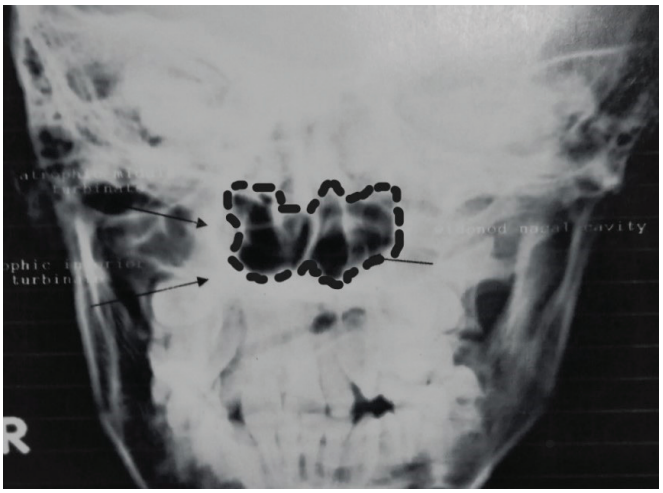

Figure 4: Radiolucent area in plain radiography (marked out in broken line)

in group-1 cases (40% occurrence during post-monsoon, i.e., July-August). There was no significant difference in seasonal variation between the 2 groups (X-square = 2.5156; df = 3; *p*-value= 0.47).

Nasal crusting was much more common in group-1 (100%) than group-2 (11%). Similarly, few symptoms were far more common in group-1 than group-2 such as nasal obstruction (81% vs. 31%) and nasal discharge (65% vs. 14%). Furthermore, evidences of anosmia and maggots (figure 3) were encountered exclusively in group-1 cases. Table 1 reveals enhanced severity of symptom in group 1. Accordingly, a statistically significant difference was appreciated across all the symptoms is evident except nasal dryness and depression, the reason being that the former is an inclusion criterion while latter is limited to only one case. Overall, the symptoms were more severe in group 1.

The clinical measurements of intranasal dimensions are shown in table 2 while their analysis summary is depicted in table 3. The comparison between left IT-S, right IT-S, left MT-S, right MT-S were statistically significant (Fisher exact test p-values of 0.0003; 0.00; 0.02 & 0.0008, respectively).

Table 1: Symptom analysis.

	Group 1 (n = 37)	Group 2 (N = 63)	X*value/ Fischer exact test	*p*-value
Nasal dryness	37	63	F	1
Nasal crusting	37	7	F	0
Epistaxis	25	19	11.76	0.0006
Headache	32	40	5.02	0.025
Nasal blockade	30	20	20.76	0
Nasal discharge	24	9	24.73	0
Anosmia	14	0	24.66	0
Depression	1	0	F	0.37
Maggots	8	0	F	0.0002

A statistically significant decrease in haemoglobin level was appreciated in group-1 (Fisher exact test p-values of 0.0015), but no significant difference in TLC, DLC or ESR was seen. The bacteriology across the 2 groups (Table 4) depicts *Klebsiella ozaenaeas* most common in group-1 while *Staphylococcus aureus* in group-2. Similarly, mycology across 2 groups (table 5) revealed candida as the most common fungus encountered in group-1.

The radiological dimensions of radiolucent areas across the 2 groups are depicted in Table 6. The mean 2-dimentional radiolucent area in group-1 was 386.16 mm^2 (SD 2.53) while that of group-2 was 272.27 mm^2 (SD 74.83) and a significant difference was found between the 2 groups (*p-value* 0.001). Figure 4 reveals the radiolucent area on plain radiography.

DISCUSSION

The classical presentation of advanced disease is seldom encountered, as was seen a few decades earlier and the use of antibiotics has significantly reduced the clinical morbidity. Hence, the pattern appreciated in the current era is that of a mild to moderate variety of atrophic rhinitis and more prevalence of localised rhinitis sicca. It is important to mention that only a third of all the patients who presented with nasal dryness were diagnosed to have

Table 2: Intranasal measurements

Measurement (mm)	GROUP 1				GROUP 2			
	LT (IT-S)	LT (MT-S)	RT (IT-S)	RT (MT-S)	LT (IT-S)	LT (MT-S)	RT (IT-S)	RT (MT-S)
0-2	5	23	2	19	7	54	13	53
3-4	4	6	3	10	8	7	29	9
5-6	11	4	12	4	20	1	13	1
7-8	13	3	14	3	4	1	7	2
9-10	2	0	1	0	2	0	1	0
11-12	2	1	3	1	2	0	0	0
>13	0	0	2	0	0	0	0	0

RT: right, LT: Left, IT: inferior turbinate, MT: middle turbinate; S: septum

AR or RS. The ages of presentation of group-1 varied from 7 to 30 years in accordance with a previous study conducted in 1987 in north India[2] that revealed the distribution from 3 to 30 years. The female predominance of has been universally encountered[3,4] and we have even appreciated worsening of disease during menstruation and pregnancy. These observations do reflect some endocrinal influence on the disease process. Although familial etiology has been suggested,[5] our study could not establish any such association in the absence of family history. Our study further revealed enhanced prevalence during October to March, while the maximum patients were seen in December. The predisposition of nasal miasis during hot and humid weather has been reported earlier[6] and accordingly, we also found a maximum of such occurrences after August. Although AR is reported to occur more in industrial workers[3] but our study could not establish any relationship with any particular occupation. To summarize this aspect, 24.4% were farmers, 40.5% housewives and 32.4% were students. The duration of symptoms for AR/RS on average ranged from 2 months to 3 year with maximum duration of 12 years reported in the case that presented in a very morbid state of nasal miasis with multiple previous treatment interventions. The symptomatology of AR/RS patients was found to be quite unique and also different than the western world.

Table 3: Analysis of intranasal measurements.

	Group 1		Group 2		*p*-value
	N	Mean (SD)	N	Mean (SD)	
RT (MT-S)	37	3.14 (2.53)	63	1.75 (1.41)	0.003
RT (IT-S)	37	7.00 (2.92)	63	3.94 (1.85)	<0.001
LT (MT-S)	37	2.86 (2.56)	63	1.79 (1.15)	0.02
LT (IT-S)	37	6.00 (2.64)	63	4.57 (2.18)	0.004

(RT: right, LT: Left, IT: inferior turbinate, MT: middle turbinate; S: septum)

Table 4: Bacteriology and Mycology

	Group 1 (N = 37)	Group 2 (N = 63)
Bacteriology		
S. Aureus	10.8	1.58
Pseudomonas	10.8	1.58
Klebsiella	16.2	0
Proteus	2.7	0
E. coli	5.4	0
Citrobacter	2.7	0
Acinetobacter	5.4	0
Sterile	40.5	44.44
Normal commensals	5.4	44.44
Mycology		
Aspergillus flavus	2.7	0
Candida sp	5.4	0
Acrenonium	0	1.58
Septate fungi	2.7	1.58
Budding yeast like cells	0	1.58
Sterile	89.18	95.2

Values in %

Table 5: Measurements of radiolucent areas

Area (mm^2)	Group 1	Group 2
<100	0	1
101–200	2	6
201–300	6	45
301–400	13	9
401–500	8	1
501–600	6	1
>600	1	0

While a 100% prevalence of nasal crusting was noted in our patients, the western literature mentions it to the tune of 54.6%.[4] A more severe symptomatology seen in our patients is possibly due to tropical climate with dry weather and late presentation due to geographical limitations and other social factors. Epistaxis was appreciated in 67.5% of our study population which seems almost twice than the western world (36.4%).[4] The 37.8% prevalence of anosmia in our population is also more than that reported from the western literature (27.3%).[4] However, we could appreciate miasis in only 21.6%, that in fact is lesser than what has been reported from India earlier (38.4% by Sharma *et al.*[1]; and 41% by Singh *et al.*[7]). The probable reason is an overall improvement of socio-economic condition along with a better antibiotic coverage and hygiene in modern patients.

The consistent association of intranasal dimensions with nasal mucosal atrophy suggests that such dimensions can be used as a surrogate marker not only in the identification and quantification of disease but also for grading the improvement with treatment. However, a similar preposition using radiological assessment of atrophy is not that conclusive, given multiple variables in assessment, including inter-observer subjectivity and quality of radiograms. The significant association of anaemia can be due to many factors. Apart from some element of malnutrition in our Indian population, the female population of the country, particularly those of child bearing age, is well known to have anaemia. Since our study population was predominantly females of lower socio-economic status and rural background, this association is not surprising. Anaemia in AR has been reported to be mild in Indian patients[8] and considered to be due to iron deficiency.[9] However, another Indian study did not report any evidence of malnutrition or anaemia.[2]

K. ozaenae (16.2%) still happens to be the commonest bacteria isolated from AR, but the evolving bacteriology suggests a lesser incidence of its association as compared to previous reports.[7,10] While other bacteria have been demonstrated, the overall bacterial load seems to be much lower in group-2 patients. In the post-antibiotic era, it is not surprising to find a sterile culture in over 40% patients of AR and as expected, a similar such distribution is evident in group-2 as well. *S. aureus* is the commonest bacterial infection in group-2 (7.9%) while *S. aureus* (10.8%) and Pseudomonas (10.8%) are other important bacteria associated with group-1 patients. The mycological assessment revealed a sterile profile in 90% of patients in either group, but Candida and Aspergillus were exclusively seen with AR/RS and Candida (5.4%) was the most common fungus isolated in group-1 followed by Aspergillus (2.7%).

The aetiology of AR is still debatable and possibly considered multifactorial. Many factors with systemic effects such as endocrinal effects, autoimmunity, genetic predisposition etc. predispose the nasal complex to undergo atrophy and further predispose to bacterial infection over this weakened local immunity. The underlying anosmia may reflect the underlying systemic pathology and evident nasal condition, which reflects severity of the disease.[11] A comprehensive report on olfaction in AR, along with the implication of treatment in the improvement of olfaction and clinical syndrome in AR is discussed elsewhere.[11] Ironically, the mainstay of treatment is still focused on the improvement of local nasal conditions. Hence, the clinical improvement of the local pathology does not truly reflect the resolution of true underlying disease and thereby its cure.

Implications for Future Therapy: The surgical option, particularly Young's operation, is better suited for the established severe category of atrophic rhinitis and our facility experience in this regard has already been published[11]. The usual conservative approach for milder symptoms involves nasal lubricants with multivitamins, while additional nasal douche with antibacterial measures in moderate cases. The common bacteria implicated in moderate nasal atrophy as per this study include *S.aureus*, Pseudomonas sp., and Klebsiella sp in both groups. In contrast, only the classical (group 1) cases revealed *A. flavus* and Candida sp as the most common fungi, while these were consistently absent in group 2. Accordingly, ideal antibiotic treatment in all cases (both groups) needs to be tailored as per the culture report depicting *S. aureus* (Dicloxacillin/cephalexin)/Pseudomonas sp. (ciprofloxacin/gentamycin)/Klebsiella sp.

(ciprofloxacin/ third-generation cephalosporins). The fungal culture may be undertaken in group I cases and thereby treated as per the report indicating *A. flavus* (voriconazole. Itraconazole), and/ or Candida sp (fluconazole/ itraconazole). Overall, the empirical antimicrobial treatment in the absence of culture report needs to include a broad-spectrum antibiotic such as ciprofloxacin, particularly in moderately severe cases, while fungal elements are best dealt with conservative measures unless otherwise significant. The group 2 cases possibly will never require any antifungal medications. The classical alkaline nasal douche may be the best accompaniment in every case and lately the benefits of *jal-neti* are not to be underestimated since the later does not only provide cleaning/ lubrication but also a definite parasympathetic stimulation.

CONCLUSION

The changes in presentations of AR/RS must be considered in reframing the management protocol and the milder disease needs to be suspected early in patients with nasal dryness for a better overall management and long term prognosis.

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Conflict of Interest: All the authors declare that there is no conflict of interest

Ethics Statement: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

REFERENCES

1. Sharma H, Dayal D, Agrawal SP. Nasal myiasis: review of 10 years' experience. J Laryngol Otol. 1989;103(5):489-91.
2. Ghosh P. Vestibuloplasty (a new one-stage operation for atrophic rhinitis). J Laryngol Otol. 1987;101(9):905-9.
3. Bunnag C, Jareoncharsri P, Tansuriyawong P, Bhothisuwan W, Chantarakul N. Characteristics of atrophic rhinitis in Thai patients at the Siriraj Hospital. Rhinology 1999;37: 125–30.
4. Ly TH, deShazo RD, Olivier J, Stringer SP, Daley W, Stodard CM. Diagnostic criteria for atrophic rhinosinusitis. Am J Med. 2009;122(8):747-53.
5. Amreliwala MS, Jain SKT, Raizada RM, Sinha V, Chaturvedi VN. Atrophic rhinitis: an inherited condition. Indian Journal of Clinical Practice 1993;4:43–6.
6. Jain SKT, Amreliwala MS, Sinha V et al. Clinical profile of atrophic rhinitis with special reference to the status of maxillary sinuses. Indian Journal of Otolaryngology and Head and Neck Surgery. 1996;48:19–24.
7. Singh I, Raizada RM, Chaturvedi VN. Nasal Mucous Ciliary Clearance and Olfaction in Atrophic Rhinitis, Ind J Otolaryngol Head & Neck Surg. 1998;50(1):57-59.
8. Gadre KC, Bhargava KB, Pradhan RY, Lodaya JD, Ingle MV. Closure of the nostrils (Young's operation) in atrophic rhinitis. J Laryngol Otol. 1971;85(7):711-4.
9. Bernat, Ivan, (1965): Ozaena, A manifestation of Iron Deficiency, pergamon Press, Oxford,First English edition, P-4.
10. Effat KG, Madany NM. Microbiological study of role of fungi in primary atrophic rhinitis. J Laryngol Otol. 2009;123(6):631-4.
11. Mishra A, Shukla NM, Verma V, Mishra SC. Olfaction in Primary Atrophic Rhinitis and Effect of Treatment. OTO Open 2020;4(3):1–8 DOI:10.1177/2473974X20949503