

Nasolacrimal Duct Obstruction in Epiphoric Patients in the North Indian Population

Asra Warees¹, Afreen Abbas¹, Mohd Faraz², Saqib Zameer³, Zeeshan Akram², Urooj Fatima², Mudassir Alam⁴

¹ Department of Ophthalmology, J.N. Medical College, Paramedical College, Faculty of Medicine, Aligarh Muslim University, Aligarh, Uttar Pradesh, India

² Department of Radiodiagnosis, J.N. Medical College, Paramedical College, Faculty of Medicine, Aligarh Muslim University, Aligarh, Uttar Pradesh, India

³ Department of Microbiology and Pathology, J.N. Medical College, Paramedical College, Faculty of Medicine, Aligarh Muslim University, Aligarh, Uttar Pradesh, India

⁴ Department of Biological Sciences, Indian Biological Sciences and Research Institute (IBRI), Noida, India

Abstract:

Introduction: Epiphora, or excessive tear production, is a common presenting complaint in ophthalmology and is frequently associated with acquired nasolacrimal duct obstruction. The purpose of this study is to find out the frequency (prevalence) of epiphora symptoms in patients with acquired nasolacrimal duct obstruction in a developing country, who attend tertiary eye care centres.

Material and methods: Our study cross-sectionally analysed 300 patients over 19 years old with complaints of epiphora lasting at least 3 months, between January 2025 and May 2025. A basic ocular surface examination was performed using a handheld torch to assess the anterior eye. All participants underwent the ROPLAS test followed by lacrimal syringing. All data were recorded and analysed properly.

Results: Sixty patients (20%) experienced unilateral epiphora, while the majority, 240 (80%), reported bilateral epiphora. 208 (69.33%) were females, and 92 (30.66%) were males, indicating a high rate of epiphora in the female population. An occasional tearing pattern was observed in 224 (74.66%) cases, and a continuous tearing pattern in 76 (25.33%) cases. The ROPLAS test showed positive results in 67 (22.33%) and negative results in 233 (77.66%), among younger people. The most common cause of epiphora was blocked tear ducts, with a p-value of <0.001.

Conclusion: This study suggests that nasolacrimal duct obstruction is the main cause of epiphora. In total, 197 (65.66%) patients had lacrimal system obstruction or blockage, highlighting the high frequency of epiphora in northern India.

Key words:

nasal cavity, ROPLAS, nasolacrimal duct blockage, lacrimal syringing, epiphora.

1. Introduction

Epiphora is a condition of excessive tearing of the eyes or a watery eye, caused by abnormalities affecting any part of the nasolacrimal duct system, leading to excessive tearing, which significantly impacts the quality of life [1]. Watery eye/s (epiphora) is among the most common symptoms and complaints in patients seen by ophthalmologists in oculoplastic clinics [2]. The most frequent disorder of the lacrimal drainage system is nasolacrimal duct obstruction (NLDO), also known as dacryostenosis [3]. Epiphora can also result from disruptions in the tear production process [4]. Tears are produced in the lacrimal glands, located in the superolateral part of the orbit. Every blink of the eyes spreads the tears over the eye, leading to vaporization of tears through the surface and thus draining out from the nasolacrimal duct system [5]. The nasolacrimal duct system consists of puncta (lower and upper puncta), which are orifices positioned on the external surface of the eyelids. The canaliculi (superior and inferior canaliculi) are tiny canals joining the puncta with the nasolacrimal sac [6]. The nasolacrimal sac acts as a tear collection area, connecting to the nasolacrimal duct that transfers tears into the nasal cavity [7, 8]. Figure 1 shows the nasolacrimal duct system and the anatomical pathway involved in tear drainage.

Many factors may cause an interruption in the balance between tear loss and tear production, leading to epiphora. Increased tear production results in epiphora, while tear loss can trigger reflexive tearing, also causing epiphora [9]. The main causes of significant differences in tear volume include nasolacrimal duct obstruction or stenosis, eyelid malposition, failure of the lacrimal pump, and reflex tearing due to dry eye [10]. Patients with acquired dacryoste-

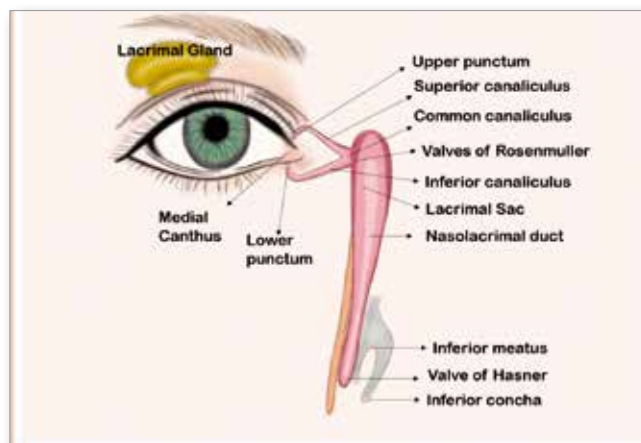


Fig. 1. Schematic representation of the nasolacrimal duct system demonstrating the anatomical pathway and key structures involved in tear drainage.

nosis often present with epiphora, which remains the most common complaint in clinical practice [11]. Other causes of epiphora include conditions like conjunctivitis with purulent or mucous discharge, dacryocystitis, and aching inflammation at the medial canthus. In some patients, epistaxis may occur alongside tumours involving the nose, sinuses, or lacrimal sac. Clinicians should ask about any history of eye surgery, glaucoma, trauma, systemic illnesses, chemotherapy, or topical medications [12]. In adults, NLDO can be caused by various other reasons, like ocular trauma, idiopathic reasons, or secondary to inflammation, neoplastic

lesions, and any kind of structural abnormality. Infections caused by viral, fungal, and bacterial organisms can lead to other ocular conditions like blepharitis, chronic conjunctivitis, and dacryocystitis, which lead to epiphora [13]. Luo, B., Li, M., Xiang, N. et al. in a study of 64 adults and 105 paediatric patients with dacryocystitis found that both gram positive and gram negative isolated equally from adult and paediatric subjects. *Streptococcus pneumoniae* was the most common isolate in both adult (11 [14.86%]) and paediatric (30 [24.79%]) dacryocystitis [14]. Nasolacrimal duct obstruction may be congenital or develop later in life. Chronic inflammation of the nasolacrimal sac can cause blockage within the passages of the lacrimal system, which is a common cause of acquired NLDO [15]. Primary acquired nasolacrimal duct obstruction is the leading cause of obstructive epiphora in adults. Secondary causes include granulomatous inflammation, neoplasia, medications, and trauma, which can be iatrogenic. Stasis of fluid in the lacrimal sac often leads to bacterial infection, known as dacryocystitis [16]. In about 94% of cases, the primary cause is characterized by nonspecific chronic inflammation, with or without fibrosis. Previous studies of Saudi Arabia report that the incidence of nasolacrimal duct obstruction is 10.1% among patients referred to oculoplastic clinics [17]. In a retrospective study, symptomatic acquired lacrimal outflow obstruction with an average annual incidence of 30.47 cases per 100,000 individuals has been reported [3]. Delayed surgery leads to the histopathologic presence of subepithelial scarring; the patient should undergo early surgery. Several factors, either alone or combined, can contribute to the development of epiphora. It often results from reflex hypersecretion triggered by ocular surface disease, and it may occur without other symptoms like burning or the feeling of a foreign body [18].

This cross-sectional study aims to find out the frequency (prevalence) of epiphora symptoms in patients with acquired nasolacrimal duct obstruction in a developing country, who visit a tertiary eye care centre. Previous studies focused on the surgical interventions and diagnostic imaging related to nasolacrimal duct obstruction, which limits data on the frequency of epiphora, especially in a developing country like India. Our study solely focused on the frequency of epiphora, variations by age, gender, laterality, and surgical interventions in patients diagnosed with the acquired NLDO.

2. Material and methods

The study was approved by the Institutional Ethics Committee (IECJNMC/1855) at Jawaharlal Nehru Medical College (JNMC) in Aligarh, Uttar Pradesh. This study was performed at the Ocular Plastic Clinic of the Eye Outpatient Patient Department (OPD) at JNMC. Considering the cross-sectional nature of the study and the use of anonymised patient data, written informed consent was obtained from each individual who enrolled in this study. All procedures were performed as per the Declaration of Ethical Guidelines. Data from the medical records of 300 patients who visited the Oculopla-

stic Clinic at JNMC were collected and analysed for epiphora between January 2025 and May 2025 at the tertiary level in North India. The participants included patients with complaints of eye watering, aged 20–70 years, of both genders. Patients with watery eyes caused by infections like conjunctivitis, eyelid problems, trauma, sinus infections, or other medical conditions were excluded. The study involved 300 patients with epiphora, older than 19 years, with symptoms lasting at least 3 months. Each patient underwent a detailed interview covering demographic details, clinical presentation, previous medical history, duration of symptoms, and whether the condition was unilateral or bilateral. Patients were asked about the type of discharge, such as watery or mucous. After obtaining written consent, each patient was examined carefully. A basic ocular surface examination was performed using a handheld torch to assess the front part of the eye and surface issues like conjunctival or corneal changes that might cause excessive tearing or other tear secretion problems.

Patients underwent ROPLAS (regurgitation on pressure over the lacrimal sac area), a clinical diagnostic test that helps to identify conditions like dacryocystitis (inflammation of the tear sac), verify patency, and detect blockages in the lacrimal drainage system by gently pressing on the lacrimal sac area at the inner corner of the eye with a clean finger to observe for any discharge from the puncta or drainage pathways. The findings were interpreted as follows: ROPLAS positive indicates issues like a lacrimal sac infection or an obstruction in the nasolacrimal duct, shown by reflux of mucopurulent or clear fluid from the punctum. ROPLAS negative suggests a healthy, unobstructed nasolacrimal drainage system, with no discharge or fluid reflux. The results of the ROPLAS test were recorded after performing the test. Lacrimal syringing followed by the ROPLAS test was performed for inspection of the drainage system; either the nasolacrimal duct is patent or blocked. A 25–26G sterile cannula connected to a 2–5 ml syringe filled with sterile saline is used for lacrimal syringing. The fluid passes through the nasolacrimal duct and is felt in the throat or, if swallowed by the patient, indicates proper tear drainage with no obstruction. If the saline regurgitates from the same punctum where it was injected, this suggests a blockage in the canaliculus. If it exits from the opposite punctum, the obstruction is likely in the common canaliculus, where the upper and lower canaliculi meet before reaching the sac. When no fluid regurgitates and the patient does not feel the saline in the throat, this indicates a complete blockage further down in the nasolacrimal duct, usually at its opening into the nose. Sometimes, partial obstruction may be indicated by a combination of partial reflux and a faint sensation of saline in the throat. The interpretations of the lacrimal syringing procedure are mentioned in Tab. I: feeling saline in the throat indicates a patent system (no blockage); regurgitation from the same punctum points to an obstruction in the canaliculus (proximal obstruction); regurgitation from the opposite punctum suggests a blockage in the common canaliculus; no regurgitation or saline

Observation	Interpretation	Site of obstruction
Saline reaches the throat	The tear drainage system is clear (patent)	Patent system (No blockage)
Regurgitation from the same puncta	Blockage in the small tube (canaliculus)	Obstruction near the eye (Proximal obstruction)
Regurgitation from the opposite puncta	Blockage in the common canaliculus that connects both small tubes	Obstruction in the common canaliculus
No regurgitation/ No saline comes back out	The main duct (nasolacrimal duct) is completely blocked	Obstruction further down the drainage systems (distal obstruction)
Some saline flows to the nose, but some comes back out	Partial obstruction anywhere along the tear drainage path	Location of the partial obstruction varies (depends on the site)

Tab. I. Interpretations of the lacrimal syringing procedure.

sensation indicates a complete nasolacrimal duct blockage (distal obstruction); and partial flow to the nose with some reflux indicates partial obstruction at some point along the pathway, depending on the site. Epiphora is caused by multiple factors and is termed multifactorial. After diagnosis, appropriate treatment was provided, and patients were followed up. Most underwent dacryocystorhinostomy surgery (DCR), while some had probing or dilation of the puncta. All results of every individual were recorded and analysed.

3. Result

This study aims to determine the prevalence of epiphora symptoms in patients with acquired nasolacrimal duct obstruction (NLDO) among 300 patients in the North Indian population of the eye outpatient department at JNMC. A total of 300 patients with complaints of eye watering were examined. Of these, 208 (69.33%) were females, and 92 (30.66%) were males, with a male-to-female ratio of approximately 1:2.26. The average age of all participants was 40.8 years. This indicates that epiphora was more common in females than in males. Among these patients, 60 (20%) experienced symptoms in only one eye (unilateral epiphora), while the majority, 240 (80%), reported symptoms in both eyes (bilateral epiphora), as shown in Fig. 2. This shows that bilateral epiphora was more common than unilateral epiphora. The most common issue reported was occasional tearing in 224 (74.66%) cases and continuous tearing in 76 (25.33%) cases, as shown in Tab. II.

Most epiphoric patients, 126 (42%), presented with nasolacrimal duct blockage, accompanied by watery discharge, while 71 (23.66%) experienced blockages with mucopurulent secretions, which is more commonly seen in older individuals due to age-related changes in tear drainage, infection, or allergies (Fig. 3). The most common cause is blocked tear ducts, with a p-value of <0.001.

Older people are more likely to have blocked tear ducts; specifically, a diagnostic test called the ROPLAS test showed positive results in 67 (22.33%) and negative results in 233 (77.66%) younger people. Clinical evaluation and diagnostic tests, such as syringing, are used to check lacrimal drainage dysfunction with partial or complete obstruction of the lacrimal duct. Some patients, 103 (34.33%), had a clear or unobstructed drainage system, indicating no blockage (patent) was present and fluid flowed normally into the nose. However, 197 (65.66%) exhibited irregular syringing patterns, indicating an obstruction or issue within their lacrimal drainage system. Several abnormal findings indicate various issues related to the tear drainage system. The most common type of blockage was observed in several cases, such as punctal stenosis, a narrowing of the tear duct opening, which was found in 16 (5.33%); regurgitation from the opposite puncta with clear fluid (RFOC) was seen in 47 (15.66%) cases; and regurgitation from opposite puncta with discharge fluid (RFOD) was seen in 43 (14.33%). Table III indicates infection and blockage; saline

came back out from the opposite puncta, suggesting a blockage in the common canaliculus, and regurgitation from the same puncta with discharge fluid (RFSD) was seen in 31 (10.33%) (Fig. 4).

The most common issue, observed in 60 (20%) patients, was regurgitation from the same puncta with clear fluid (RFSC), indicating a blockage in the superior and inferior canaliculi, with saline coming back out from the same tear duct, suggesting partial blockage. Among the 197 epiphora patients with abnormal syringing findings, treatment was based on the type of obstruction

Demographic Details	
Age (years)	20-70
Average Age	40.8
Standard Deviation of Age	16.70
Gender	Total number of participants (%)
Male	92 (30.66%)
Female	208 (69.33%)
Duration (Epiphora)	
< 25 months	98 (32.66%)
26-25 months	103 (34.33%)
> 50 months	99 (33%)
Laterality	
Unilateral	60 (20%)
Bilateral	240 (80%)
Pattern of tearing	
Occasional	224 (74.66%)
Continuous	76 (25.33%)
Pattern of discharge	
NLD blockage with watery discharge	126 (42%)
NLD blockage with mucopurulent discharge	71 (23.66%)

Tab. II. Demographic details of patients, including age (years), gender, duration of epiphora, and side involved.

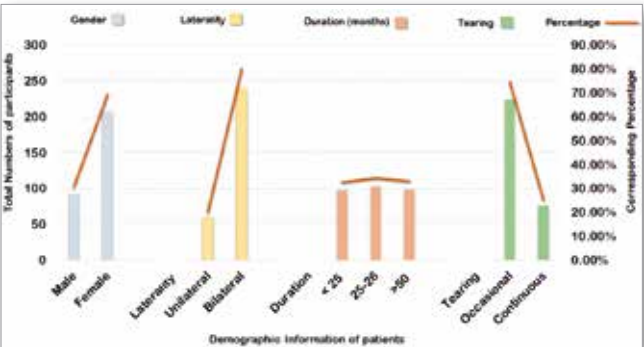


Fig. 2. Demonstrating the demographic information, in which females are more prevalent than males, and bilateral epiphora is more common than unilateral epiphora. In terms of duration, 25–26 months of epiphora is more frequent. For the pattern of tearing, occasional tearing is more common than continuous tearing.

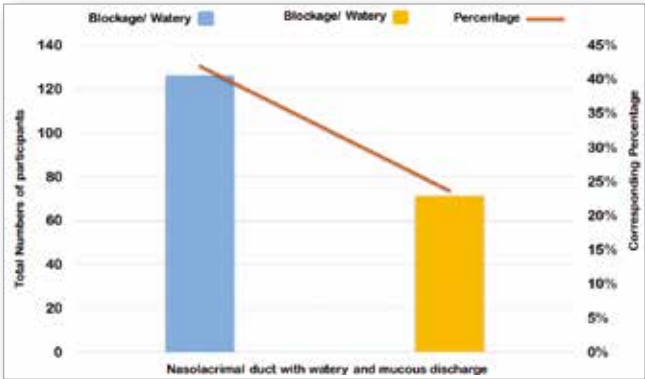


Fig. 3. The relationship between nasolacrimal duct blockage and the type of discharge, whether watery or mucopurulent. This graph indicates that watery discharge with a nasolacrimal duct blockage is more common than mucous discharge, even though mucous discharge is a key feature of the condition.

ROPLAS	Total number of participants (%)
Positive	67 (22.33%)
Negative	233 (77.66%)
Lacrimal Passage Interpretation	
Patent	103 (34.33%)
Nasolacrimal duct blockage	197(65.66%)
Syringing Interpretation	
Punctal stenosis	16 (5.33%)
RFOC	47 (15.66%)
RFOD	43 (14.33%)
RFSD	31 (10.33%)
RFSC	60 (20%)
Surgical Interventions	
Antibiotic (gentamicin) syringing	25 (8.33%)
DCR	111 (37%)
Probing	32 (10.66%)
Silicon tube insertion	13 (4.33%)
Punctal dilation	16 (5.33)

Tab. III. The interpretations of ROPLAS, lacrimal passage, lacrimal syringing, and surgical interventions.

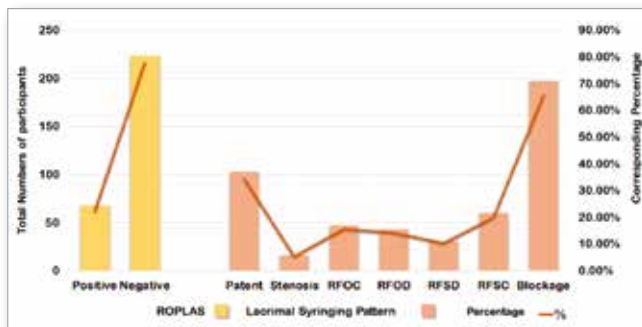


Fig. 4. Representing the ROPLAS pattern as negative and positive with the lacrimal syringing interpretations (Patent system, Punctal stenosis, RFOC: regurgitation from opposite puncta with clear fluid, RFOD: regurgitation from opposite puncta with discharge fluid, RFSD: regurgitation from same puncta with discharge fluid, and RFSC: regurgitation from same puncta with clear fluid, and nasolacrimal duct blockage).

or blockage. The most frequent issues were RFOD and RFSD, which were given antibiotics to treat bacterial infections, like dacryocystitis in 25 (8.33%) cases, and a tear duct infection before dacryocystorhinostomy (DCR) surgery was performed in 49 (16.33%) cases. Patients with RFSC were treated with DCR surgery, 39 (13%) cases, and RFOC was also managed with DCR surgery, 23 (7.66%) cases, and silicon tube insertion, 13 (4.33%) cases. Probing is a common treatment for partial nasolacrimal duct blockage, especially when syringing shows clear fluid coming back, and early canaliculus blockage was treated with probing to help open the tear duct in 32 (10.66%) cases. Punctal stenosis required punctal dilation in 16 (5.33%) cases. The remaining 103 (34.33%) patients with patent syringing were treated with non-surgical methods such as lubricants, lid hygiene, or management of the surface disease.

4. Discussion

The nasolacrimal duct system disorders that cause epiphora are a common ophthalmologic issue. Epiphora is a chronic condition that affects 14% of the population over the age of 40 years [19, 20]. Aetiologies of epiphora are multifactorial; it can be due to hypersecretion of the lacrimal gland, dry eye, NLDO, eyelid malposition, ocular surface disease with reflex tearing, or tear pump failure. A total of 300 patients with complaints of eye watering were examined. Of these, 208 (69.33%) were females, and 92 (30.66%) were males, consistent with previous literature highlighting a higher prevalence of acquired epiphora due to lacrimal obstruction. Many previous studies suggested that epiphora is more common and frequently seen in women and affects both eyes [21]. The main cause of epiphora is acquired nasolacrimal duct obstruction, mostly found in older or middle-aged women [22]. One study by Woog found that 73% of patients with nasolacrimal duct blockage were women [3]. The narrowness of the nasolacrimal canal and the sharp angle between the bony canal and the nasal floor may predispose women to chronic inflammation of the drainage system. Epiphora is an irritating symptom of primary acquired nasolacrimal duct obstruction (PANDO) that affects the quality of life of an individual [23]. In dacryocystorhinostomy (DCR), a fistula is made between the nasolacrimal sac and the nose, detouring any obstruction and allowing the passage of tears directly into the nose. In 1989, the approach to endonasal dacryocystorhinostomy was first described by McDonogh and Meiring. The most effective approach to treat epiphora is DCR, which occurs due to nasolacrimal duct blockage [24, 25]. For the assessment of nasolacrimal duct obstruction, lacrimal syringing is primarily used for diagnostic purposes and is a commonly used clinical test [2]. Nasolacrimal duct blockage can occur through various aetiologies, either from birth (congenital) or developing later in life (acquired). Both acquired and congenital nasolacrimal duct obstruction can result in tears that cannot drain properly and collect in the tear sac. This causes watery eyes, tears pooling near the eyes, and sometimes a thick pus-like discharge [21]. In certain instances, tear stasis can lead to an infection in the tear sac, known as dacryocystitis, or inflammation in the lacrimal sac [15]. Another important cause of epiphora is abnormal eyelid position. As people age, their eyelids can become looser, making it more difficult for tears to drain properly. In conditions such as trichiasis or entropion (inward-turning of eyelashes), inward-turning cilia disrupt the ocular surface, leading to epiphora [26]. A study in Korea showed that the most common causes of epiphora include reflex tearing from dry eye, problems in the tear drainage system and drainage function, multifactorial disease, functional disease, anterior segment disease, and eyelid malposition [4]. Decreased visual acuity is infrequently noticed in patients with epiphora caused by lacrimal passage obstruction; it is vital to the assessment of contrast sensitivity to know the relationship between the symptoms and their impact on the quality of life. Dacryocystorhinostomy (DCR) surgery consists of 2 main techniques. The gold standard treatment for nasolacrimal duct obstruction is transdermal DCR or external DCR (EX-DCR) [27, 28]. This study on patients with watery eyes (epiphora) had several limitations. Important tests like the fluorescein dye disappearance test (FDDT) and Jones dye test, which help confirm the patency of the nasolacrimal duct, were not performed. Imaging techniques like dacryocystography were also not performed, which would have helped to determine the exact location of the blockage. The study was conducted at a single centre and involved data collection at one point in time from a single hospital, JNMC. There was no provision for a follow-up visit, so long-term outcomes as well as postoperative success rates remain unknown. Self-reported symptoms of epiphora by patients may lead to subjective bias. India is a large country with a diverse population; only a small group of patients in the North Indian population was studied, and it is not generalisable to other populations.

Conclusions

This study suggests that 65.66% of patients had lacrimal system obstruction or blockage, highlighting the high frequency of epiphora in northern India. The high prevalence epiphora may be attributed to other causes due to environmental factors such as exposure to dust in the workplace (construction sites, working on farms), all of which may trigger watery eyes. Seasonal changes may contribute to allergic conditions that also influence epiphora. It is important to evaluate and clinically examine the lacrimal system in patients with epiphora, especially in individuals above 45 years old. Out of every 6six patients with epiphora, one patient has nasolacrimal duct blockage. Our study adds valuable data on the frequency of epiphora with NLD blockage and supports the need for lacrimal system evaluation as a part of routine ocular examination.

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Disclosure

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Concept and design of study: Asra Warees, Mohd Faraz, and Afreen Abbas. Writing original draft: Mohd Faraz, Asra Warees, Saqib Zameer, and Zeeshan Akram. Editing: Mudassir Alam, Mohd Faraz, and Urooj Fatima. Review of the manuscript: Asra Warees, Mohd Faraz, and Afreen Abbas. Supervision: Mudassir Alam.

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Reprint requests to:

Mudassir Alam, MD (e-mail: syedalamalig@gmail.com)
 Indian Biological Sciences and Research Institute (IBRI)
 Noida-201301, India
 Institutional e-mail: gh7949@myamu.ac.in
 Orcid ID: 0000-0001-8255-0273, +91-8171331795