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PROSTAGLANDIN ANALOGUE–CONTAINING EYELASH SERUMS AND THEIR POTENTIAL OCULAR IMPLICATIONS: A NARRATIVE REVIEW

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Abstract
Background: The rising popularity of over-the-counter eyelash serums containing prostaglandin analogues (PGAs) has raised safety concerns due to their pharmacological origin as glaucoma treatments and their current cosmetic misuse without medical supervision.
Aim: To evaluate scientific evidence regarding the safety of PGA-containing eyelash serums, focusing on mechanisms, adverse effects, impact on intraocular pressure (IOP), and regulatory challenges.
Material and Methods: A comprehensive literature search was conducted across PubMed/MEDLINE, Scopus, and Web of Science for publications up to September 2026. Retrieved studies were qualitatively assessed and synthesized.
Results: Chronic exposure to cosmetic PGAs is associated with periocular hyperpigmentation, conjunctival hyperaemia, tear film instability, meibomian gland dysfunction, and prostaglandin-associated periorbitopathy (PAP). While direct links to de novo glaucoma are lacking, active compounds can alter IOP and affect diagnostic accuracy. Regulatory bodies like the SCCS highlight insufficient safety data for safe cosmetic use near the eye.
Conclusions: PGA-containing serums are pharmacologically active and not inert cosmetics, requiring stricter regulatory oversight, transparent labelling, enhanced cosmetovigilance, and clinical awareness.

Key words: prostaglandin analogues, cosmetic eyelash serums, eyelash hypotrichosis, adverse effects, cosmetovigilance, intraocular pressure.

1. Introduction

In recent years, the use of eyelash growth serums has become an increasingly popular category of cosmetic products. This behaviour reflects a broader consumer trend of purchasing products containing biologically active ingredients. Estimations of commercial market analyses show that the global eyelash serum market was valued at approximately USD 897.9 million in 2023 and is projected to exceed USD 1.3 billion by 2030. However, those estimates vary between market reports (1). The constantly growing popularity of eyelash growth serums is consistent with the global trend of using cosmeceuticals. This term is described as products containing active ingredients which provide pharmaceutical-like effects (2). Unlike conventional cosmetics, such products are marketed for specific biological or therapeutic-like outcomes, thereby blurring the boundary between routine cosmetic care and pharmacological treatment.

Eyelash-enhancing serums are available over the counter and can be purchased without prior ophthalmological examination. They contain a variety of ingredients and can be categorized into two main groups: containing prostaglandin analogues and non-prostaglandin analogues (3,4). Recent market analysis shows that out of 79 examined

commercially available eyelash serums, approximately 30% of them contain a prostaglandin analogue with Dechloro Dihydroxy Difluoro Ethyl Cloprostenolamine, also known as Ethyl Tafluprostamide (DDDE), and Isopropyl Cloprostenate (IPCP) being the most frequent (4). Those findings are consistent with UK's product safety research regarding prostaglandin analogues in cosmetics (5). Furthermore, analytical study has demonstrated that prostaglandin analogues may be present in commercially available eyelash serums, in some cases without being declared as an ingredient on the product label (6).

In 2022, the Scientific Committee on Consumer Safety (SCCS) raised concerns about safety of using DDDE and IPCP in close proximity of the eye. More recently, in 2026, the same organisation evaluated three well known PGAs: Ethyl Tafluprostamide, Methylamido-Dihydro-Noralfaprostal and Isopropyl Cloprostenate regarding their safety. In the SCCS's opinion, those compounds cannot be safely used in eyelash serums formulation even at low concentrations (7,8). Therefore, the safety surveillance of cosmetic products represents an additional important aspect of this issue.

Cosmetovigilance is a term which refers to the collection, evaluation, and monitoring of spontaneous reports of undesirable effects associated with the usage of cosmetic products (9,10). Within the European Union, serious undesirable effects associated with cosmetic products must be reported to the relevant national competent authorities and such information contributes to post-marketing safety surveillance (11). However, spontaneous reporting systems are limited by under-reporting, incomplete clinical information, and differences in reporting awareness and practices. In conclusion, cosmetovigilance data are primarily useful for identifying potential safety signals rather than establishing the incidence or causality of adverse events (9).

Cosmetic products containing prostaglandin analogues, such as bimatoprost and latanoprost, are of particular interest because these compounds were originally developed as glaucoma treatment (12) . Those compounds work primarily by managing the intraocular pressure (IOP) but increased eyelash-growth and pigmentation are well-documented side effects (3,13). Because of that, they were incorporated into eyelash serums. However, pharmacological activity in the periocular region may also be associated with unwanted ocular and periocular effects (14,15) . Given the increasing availability of PGA-containing cosmetic products, their widespread consumer use, the evolving regulatory position, and the limitations of post-marketing surveillance, a systematic assessment of the available evidence is warranted.

The aim of this narrative review is to summarize the current evidence regarding prostaglandin analogue-containing eyelash serums, with particular emphasis on their pharmacological activity, reported ocular and periocular adverse effects, potential mechanisms of toxicity, regulatory considerations, and the role of cosmetovigilance in identifying and monitoring safety signals.

2. Materials and Methods

A comprehensive literature search was conducted across the PubMed/MEDLINE, Scopus, and Web of Science databases to identify relevant peer-reviewed publications available up to September 2026. The search strategy combined Medical Subject Headings (MeSH) and free-text terms using the Boolean operators "AND" and "OR". The main search terms included: "prostaglandin analogues", "bimatoprost", "latanoprost", "travoprost", "tafluprost", "isopropyl cloprostenate", "ethyl tafluprostamide", "eyelash hypotrichosis", "eyelash growth", "eyelash enhancement", "eyelash serum", "prostaglandin-associated periorbitopathy", "periorbital fat atrophy", "iris pigmentation", "ocular surface", "meibomian gland", "intraocular pressure", and "glaucoma".

Clinical trials, observational studies, case reports and case series, systematic reviews, narrative reviews, pharmacological studies, and relevant regulatory and safety reports were considered. Publications were selected based on their relevance to the pharmacology, efficacy, safety, ocular and periocular adverse effects, cosmetic use, and regulatory aspects of topical prostaglandin analogues. Reference lists of relevant publications were also screened to identify additional sources. As this was a narrative review, the retrieved evidence was qualitatively assessed and narratively synthesized rather than subjected to formal systematic review or meta-analysis.

3. Mechanism of Action of Prostaglandin Analogues

Prostaglandin analogues reduce IOP primarily by increasing uveoscleral outflow of aqueous humour (16–18). Activation of prostanoid FP receptors promotes extracellular matrix remodelling within the ciliary muscle, thereby facilitating uveoscleral outflow. Relaxation of the ciliary muscle has also been proposed as a contributing mechanism, although its role is less firmly established (19,20). In addition to their ocular hypotensive effects, prostaglandins can also affect eyelash length, thickness, and pigmentation. They promote eyelash growth through activation of hair follicle receptors, inducing the transition from telogen (resting phase) to anagen (growth phase) and prolonging the anagen phase (21). Furthermore, FP receptors expressed in dermal papilla cells play a direct regulatory role in hair growth cycles (22,23). Additionally, PGAs stimulate melanogenesis, resulting in increased pigmentation and thickness of eyelashes without melanocyte proliferation (24). While effects on IOP are beneficial in glaucoma treatment, they also underlie the cosmetic effects observed in eyelash-enhancing products.

4. Clinical Application of Prostaglandin Analogues in Glaucoma Treatment

Glaucoma comprises a group of chronic, progressive neuropathies characterized by irreversible structural damage to the optic nerve and corresponding visual field loss (25). Elevated intraocular pressure (IOP) is considered the most important modifiable risk factor associated with disease progression, and reducing IOP remains the primary goal of pharmacological glaucoma treatment (26). Prostaglandin analogues (PGAs), including latanoprost, bimatoprost, travoprost and tafluprost are commonly recommended as first-line pharmacological treatment for primary open-angle glaucoma due to their high ocular hypotensive efficacy, favourable safety profile, and convenient once-daily administration (27,28). Given the substantial global burden of glaucoma and its contribution to irreversible visual impairment, PGAs remain an important component of contemporary glaucoma management (25).

Despite their therapeutic benefits, long-term topical use of PGAs may lead to ocular and periocular adverse effects. Reported effects include conjunctival hyperaemia, eyelash growth, periocular skin hyperpigmentation, irreversible iris pigmentation, and prostaglandin-associated periorbitopathy (PAP), which may manifest as periorbital fat atrophy and deepening of the upper eyelid sulcus (DUES) (29). The observation of these effects during glaucoma treatment contributed to the development and use of PGAs in eyelash-enhancing formulations (24).

5. Cosmetic use of prostaglandin analogues in eyelash serums

The consistent observation of eyelash growth during glaucoma treatment with prostaglandin analogues led to further investigation of their potential cosmetic applications. In the United States, bimatoprost ophthalmic solution 0,03% was approved by the U.S. Food and Drug Administration (FDA) in 2008 specifically for the treatment of eyelash hypotrichosis in adults (24). Clinical trials demonstrated that once-daily topical application of bimatoprost 0,03% to the upper eyelid margin significantly increases eyelash length, thickness, and dark pigmentation (21,24).

Driven by these results, PGAs and other structurally-related compounds (such as isopropyl cloprostenate, dechloro dihydroxy difluoro ethylcloprostenolamide, and norbimatoprost) have been incorporated into commercially available over-the-counter (OTC) eyelash-enhancing serums (21,30). To circumvent regulatory restrictions regarding prescription-only substances, cosmetic formulations frequently rely on structural analogues that exhibit similar receptor-binding profiles despite lacking formal pharmaceutical oversight. Unlike prescription ophthalmic formulations, cosmetic eyelash serums containing prostaglandin-related compounds are not subject to the same regulatory requirements and ophthalmological supervision, raising concerns regarding their long-term ocular surface and structural safety (3,30). However, these substances may differ in their pharmacological properties, and the safety profile of one compound cannot necessarily be extrapolated to another.

6. Adverse Effects Associated with Cosmetic Use

Although prostaglandin analogues are considered effective and generally well-tolerated when used therapeutically in glaucoma, their cosmetic use may be associated with ocular and periocular adverse effects, particularly due to prolonged exposure without medical supervision (24,29).

Reported adverse effects associated with cosmetic PGA exposure include:

1. Periocular hyperpigmentation: Darkening of the periocular skin has been reported with topical prostaglandin analogue use and is generally considered reversible after treatment discontinuation, although the time to resolution may vary (30,31).
2. Iris pigmentation changes: Increased pigmentation of the iris is associated with prostaglandin analogue therapy and is thought to result primarily from stimulation of melanogenesis in iridial melanocytes. Unlike periocular skin pigmentation, iris pigmentation is generally considered permanent or only very slowly reversible after treatment discontinuation (29,31). However, the risk of iris pigmentation associated specifically with eyelash serums has not been adequately characterized, as most available evidence derives from ophthalmic administration of PGAs for glaucoma (3,29).
3. Conjunctival hyperaemia: Conjunctival vasodilation associated with local prostaglandin activity may result in visible ocular redness. Conjunctival hyperaemia is a well-recognized local adverse effect of topical PGA therapy and is generally mild and reversible (29,31). Importantly, a prospective study published in 2026 found increased conjunctival and ciliary hyperaemia after six weeks of daily application of a DDDE-containing eyelash serum, providing direct evidence that cosmetic PGA exposure may affect the ocular surface (32).
4. Prostaglandin-associated periorbitopathy (PAP): Structural tissue changes including orbital fat atrophy, deepening of the upper eyelid sulcus (DUES), enophthalmos, and eyelid ptosis. Unlike cutaneous pigmentation, these structural changes may only partially resolve or remain irreversible after cessation of use (14,31,33).
5. Ocular surface irritation and tear film instability: Symptoms including pruritus, burning sensations, dry eye disease (DED), meibomian gland dysfunction (MGD), and contact blepharitis resulting from chronic exposure of the eyelid margin to active chemical agents. (30,34).

Importantly, most evidence regarding the ocular and periocular safety of prostaglandin analogues originates from their therapeutic use in glaucoma, whereas evidence specifically addressing cosmetic eyelash formulations remains

limited and heterogeneous. Differences in formulation, concentration, route of exposure, application technique, and the pharmacological properties of individual prostaglandin-related compounds further limit direct extrapolation from ophthalmic therapy to cosmetic use (3–6,29,32).

The key differences between prostaglandin analogues used in regulated ophthalmic therapy and prostaglandin-related compounds identified in cosmetic eyelash products are summarized in Table 1.

Table 1. Comparison of prostaglandin analogues used in ophthalmology and cosmetics

Feature	Ophthalmic use	Cosmetic use
Primary Indication	Glaucoma, ocular hypertension	Eyelash hypotrichosis, eyelash lenghtening, thickening and darkening
Regulatory Status	Prescription-only pharmaceutical	Over-the-counter (OTC) cosmetics / cosmeceuticals
Main active compounds	Latanoprost, bimatoprost, travoprost, tafluprost	Bimatoprost, isopropyl cloprostenate, DDDE, and other structural analogues
Dose control & Stability	Strict pharmaceutical standards and quality control	Variable concentrations, frequent lack of standardization
Route/application	Ophthalmic administration	Application to upper eyelid/lash margin
Intended duration	Long-term treatment under clinical monitoring	Potentially prolonged cosmetic use
Medical Supervision	Regular ophthalmological monitoring	None (self-application by consumer)
Safety data	Well-established through rigorous clinical trials	Limited long-term prospective safety data
Adverse effects	Monitored and managed by professionals	Often underreported or unrecognized by consumers
Post-market surveillance	Pharmacovigilance	Cosmetovigilance

7. Potential Impact on Intraocular Pressure and Glaucoma

Because prostaglandin analogues exert a well-established intraocular pressure (IOP)-lowering effect, uncontrolled exposure to cosmetic eyelash serums containing pharmacologically active prostaglandin-related compounds raises theoretical concerns regarding their potential influence on IOP (28,35). The magnitude of this effect is likely to depend on the specific compound, concentration, formulation, frequency of application, and extent of ocular exposure. Importantly, however, direct evidence demonstrating clinically significant IOP reduction following the use of cosmetic eyelash serums remains limited. In clinical studies of bimatoprost 0.03% used for eyelash hypotrichosis, changes in IOP were small and not considered clinically meaningful, suggesting that topical application to the eyelid margin does not necessarily produce the same IOP-lowering effect as direct ophthalmic administration (24,35) .

Nevertheless, repeated application close to the ocular surface may result in unintended exposure of the conjunctiva and ocular tissues, particularly when the product is applied excessively or migrates into the eye. This is of particular relevance because prostaglandin analogues are pharmacologically active at very low concentrations, and the SCCS has specifically raised concerns regarding the use of prostaglandin analogues in cosmetic products intended for application in the proximity of the eye (7,8). The absence of standardized concentrations and differences in the pharmacological activity of individual prostaglandin-related compounds further complicate the prediction of their effects on IOP.

From a diagnostic perspective, any sustained pharmacological reduction in IOP could theoretically influence the interpretation of IOP measurements in individuals undergoing assessment for glaucoma or ocular hypertension. IOP is an important component of glaucoma assessment, although it should not be interpreted in isolation because glaucoma diagnosis and risk stratification also depend on optic nerve structure, retinal nerve fibre layer characteristics, visual field testing, and other clinical parameters (27,35). Therefore, even if the effect of cosmetic PGA exposure on IOP is small, clinicians should be aware of the possibility of ongoing exposure when interpreting IOP measurements in patients who regularly use eyelash-enhancing products.

Conversely, the assumption that discontinuation of a cosmetic PGA-containing serum causes a clinically relevant rebound elevation in IOP should be treated with caution. Although, withdrawal of IOP-lowering therapy results in loss of the pharmacological effect and return of IOP toward the patient's untreated level, there is currently insufficient evidence to demonstrate a specific rebound phenomenon following discontinuation of cosmetic eyelash serums. Thus, rather than describing rebound elevation as an established adverse effect, it is more appropriate to consider the possibility that discontinuation may simply remove any pre-existing IOP-lowering effect in susceptible individuals (19,28).

An additional concern relates to patients with undiagnosed ocular hypertension or glaucoma. Although there is currently no robust evidence that cosmetic eyelash serums cause glaucoma de novo, inadvertent exposure to pharmacologically active prostaglandin analogues may alter ocular parameters in individuals who already have an underlying ocular disorder. Conversely, because the available clinical evidence for cosmetic formulations is sparse, it remains unclear whether long-term, low-level exposure has any clinically meaningful effect on glaucoma risk, disease progression, or subsequent response to IOP-lowering therapy.

Importantly, the current evidence base is derived predominantly from therapeutic ophthalmic use of prostaglandin analogues, whereas studies specifically evaluating IOP and glaucoma-related outcomes in users of cosmetic eyelash serums are scarce. This distinction is particularly relevant because cosmetic products may contain structurally related prostaglandin compounds, such as isopropyl cloprostenate or dechloro dihydroxy difluoro ethylcloprostenolamide, whose pharmacological and safety profiles cannot necessarily be extrapolated from those of established ophthalmic agents such as latanoprost or bimatoprost (3–6,8). Recent regulatory assessments have likewise emphasized the limited safety data available for several prostaglandin analogues used in cosmetic products, particularly those intended for application near the eye (7,8) .

Taken together, current evidence does not support a direct causal association between cosmetic prostaglandin-containing eyelash serums and the development of glaucoma. However, the pharmacological activity of these compounds, their application in close proximity to the ocular surface, and the limited availability of long-term clinical data justify continued ophthalmological surveillance and further prospective investigation. Future studies should specifically evaluate changes in IOP, optic nerve parameters, visual fields, and ocular surface characteristics in long-term users of prostaglandin analogue-containing eyelash products rather than relying exclusively on evidence derived from glaucoma therapy.

8. Cosmetovigilance and Post-Marketing Surveillance

As previously described, cosmetovigilance refers to the monitoring, assessment, and prevention of undesirable effects associated with cosmetic products after they have been placed on the market (9–11). It represents an important component of cosmetic safety surveillance because pre-market safety assessment cannot predict all adverse events that may occur during widespread, prolonged, or inappropriate product use. In the context of PGAs-containing eyelash serums, cosmetovigilance is particularly relevant because these products may contain pharmacologically active compounds and are applied directly to the eyelid margin in close proximity to the ocular surface .

A major challenge in cosmetovigilance is the potential underreporting of adverse events. Consumers may not recognize that symptoms such as persistent ocular redness, periocular pigmentation, eyelid asymmetry, dry eye symptoms, or changes in the appearance of the upper eyelid could be associated with an eyelash-enhancing product. Mild or slowly developing adverse effects may therefore remain unreported, while more severe cases may be reported only after prolonged exposure or after consultation with an ophthalmologist or dermatologist (9,10). In addition, consumers may discontinue a product without seeking medical advice, resulting in the loss of clinically relevant information regarding the nature and course of the adverse event.

For prostaglandin-containing eyelash products, effective cosmetovigilance should involve close collaboration between consumers, manufacturers, pharmacists, dermatologists, ophthalmologists, and regulatory authorities. Healthcare professionals may play a particularly important role in recognizing potential adverse reactions because several effects associated with prostaglandin exposure, including periocular hyperpigmentation, conjunctival hyperaemia, ocular surface symptoms, and prostaglandin-associated periorbitopathy, may initially be attributed to other ocular or dermatological conditions (14,29,31).

Another important aspect is the identification of the specific product and its composition. When an adverse event is suspected, information regarding the brand, product name, batch number, duration and frequency of use, application site, concomitant cosmetic or ophthalmic products, and time to onset of symptoms should be documented whenever possible. This information can facilitate causality assessment and help identify recurring safety signals associated with a particular product or ingredient (9–11).

Cosmetovigilance may be especially valuable for prostaglandin-related compounds for which clinical safety data are limited. Individual case reports and spontaneous adverse-event reports cannot establish causality on their own but accumulation of similar reports may reveal patterns that warrant further analytical investigation or regulatory assessment. Such signals may be particularly important when they concern products containing undeclared prostaglandin analogues or compounds for which toxicological and ophthalmological data are insufficient (5–8) .

Importantly, cosmetovigilance should not be regarded solely as a mechanism for documenting severe adverse events. Early recognition of less severe but recurrent ocular or periocular effects may provide an opportunity to identify emerging safety signals before they become widespread. This is particularly relevant for cosmetic eyelash products because their users are generally healthy individuals and the products are used for aesthetic rather than therapeutic purposes. Consequently, even relatively uncommon ocular adverse effects may have clinical significance when there is no underlying medical benefit that would justify pharmacological exposure.

Strengthening cosmetovigilance for eyelash-enhancing products could therefore include improved consumer awareness, standardized reporting of ocular and periocular adverse events, greater involvement of ophthalmologists in adverse-event assessment, and systematic evaluation of reported cases. Analytical testing of suspected products may also be necessary when the declared ingredient list does not adequately explain the observed clinical effects. Such an approach could help identify undeclared prostaglandin analogues, characterize exposure, and improve the detection of potential safety signals (5,6).

Overall, cosmetovigilance represents an important complementary approach to pre-market safety assessment for prostaglandin-containing eyelash products. Given the limited long-term clinical evidence, systematic collection and evaluation of adverse-event reports may provide valuable real-world information regarding the ocular and periocular safety of these products. Integration of cosmetovigilance data with analytical testing, clinical research, and regulatory assessment may ultimately improve the identification of products or ingredients associated with clinically relevant ocular risks (9–11).

9. Controversies and Knowledge Gaps

Despite the increasing availability and widespread use of eyelash-enhancing products, several important clinical, pharmacological, and regulatory questions regarding chronic exposure to prostaglandin analogues remain unresolved. The current evidence base is heterogeneous and is largely derived from therapeutic ophthalmic use of established PGAs, whereas cosmetic formulations may contain structurally related compounds for which long-term clinical safety data are limited (3–8).

Several key knowledge gaps can therefore be identified:

1. Long-term ocular and periocular safety:

Although short and medium-term studies have provided evidence regarding the efficacy and tolerability of bimatoprost for eyelash hypotrichosis, there is limited evidence concerning the consequences of prolonged cosmetic exposure over several years. In particular, the long-term effects of repeated exposure on the ocular surface, tear film, meibomian glands, periocular adipose tissue, eyelid architecture, and potentially intraocular structures remain insufficiently characterized (3,14,15,29,32–34). A recent prospective study of a DDDE-containing eyelash serum demonstrated alterations in tear film stability and increased conjunctival and ciliary hyperaemia after six weeks of use, although no significant changes in meibomian gland morphology or ocular surface staining were observed (32). These findings highlight the need for longer prospective studies rather than short-term evaluations alone. Importantly, evidence regarding the safety of bimatoprost cannot automatically be extrapolated to other prostaglandin-related compounds used in cosmetic formulations.

2. Variability in dose, formulation, and active ingredients:

Commercial eyelash serums may differ substantially in the identity, concentration, formulation, and stability of their active compounds (3–6). Analytical investigations have identified prostaglandin-related substances in cosmetic products, including compounds that may not be clearly declared on product labels (5,6). Such variability complicates the assessment of exposure and makes it difficult to compare safety data between products. Moreover, structurally related compounds may have different receptor affinities, pharmacological potency, metabolic characteristics, and toxicological profiles. Consequently, the presence of a prostaglandin-related compound in a cosmetic product should not be considered pharmacologically equivalent to a licensed ophthalmic PGA.

3. Effects in patients with glaucoma or ocular hypertension.

The potential interaction between cosmetic PGA exposure and prescribed glaucoma therapy remains insufficiently studied. In patients already receiving IOP-lowering medication, concomitant exposure to a prostaglandin-containing eyelash product could theoretically contribute to an additional reduction in IOP, although the magnitude and clinical relevance of such an effect have not been adequately established (28,35). Conversely, discontinuation of the cosmetic product could remove any additional IOP-lowering effect. There is currently insufficient evidence to suggest that cosmetic PGA exposure causes clinically relevant receptor desensitization or alters the long-term response to prescribed glaucoma therapy. These possibilities should therefore be regarded as research questions rather than established clinical effects.

4. Systemic exposure and reproductive or developmental safety:

The extent of systemic exposure resulting from chronic application of PGA-containing eyelash products remains incompletely characterized. Although eyelash serums are applied topically in very small quantities, repeated application to the eyelid margin creates a potential route for dermal and ocular absorption. Available data are insufficient to reliably quantify systemic exposure for many cosmetic PGA analogues or to determine whether chronic low-level exposure produces clinically relevant systemic concentrations (12,13). This issue has gained particular regulatory importance because the SCCS concluded in its 2026 opinion that the available data for isopropyl cloprostenate, methylamido-dihydro-noralfaprostal, and DDDE/ethyl tafluprostamide were insufficient to exclude potential reproductive and developmental toxicity (7,8). This does not establish that cosmetic use causes reproductive toxicity in humans; rather, it demonstrates that the available evidence is insufficient to establish an adequate margin of safety for the assessed compounds.

5. Uncertainty regarding compound-specific pharmacology.

A major limitation of the current literature is the tendency to group different prostaglandin-related compounds under the broad term “prostaglandin analogues.” Bimatoprost, latanoprost, travoprost, tafluprost, isopropyl cloprostenate, DDDE, and other related compounds differ in molecular structure and pharmacological activity. Evidence derived from prescription ophthalmic agents should therefore be interpreted cautiously when evaluating cosmetic products containing different analogues (3–8,12,13). Future research should characterize individual compounds separately rather than assuming a class-wide safety profile.

6. Lack of standardized long-term clinical monitoring.

Unlike prescription ophthalmic therapy, cosmetic eyelash products are generally used without routine ophthalmological monitoring. Consequently, gradual changes such as periocular pigmentation, eyelid contour alterations, ocular surface symptoms, or subtle IOP changes may remain undetected for prolonged periods. There is currently no standardized clinical monitoring protocol for regular users of PGA-containing eyelash products. Establishing standardized outcome measures would facilitate comparison between studies and improve the detection of clinically relevant adverse effects.

7. Incomplete post-marketing safety information.

The real-world incidence of adverse effects associated with prostaglandin-containing eyelash products is difficult to determine because adverse events may be underrecognized or underreported. Consumers may not associate ocular or periocular symptoms with a cosmetic product, while healthcare professionals may not routinely ask about eyelash-enhancing products during ophthalmological or dermatological consultations. In addition, the presence of undeclared prostaglandin analogues in some products may complicate causality assessment and identification of specific safety signals (5,6,9–11).

Overall, these knowledge gaps indicate that the principal uncertainty does not concern whether prostaglandin-related compounds are pharmacologically active—they clearly are—but rather the extent to which chronic, low-dose, unsupervised cosmetic exposure translates into clinically meaningful ocular, periocular, or systemic effects.

10. Clinical implications

The increasing use of prostaglandin-containing eyelash products has practical implications for ophthalmologists, optometrists, dermatologists, and other healthcare professionals involved in the assessment of ocular or periocular complaints. A history of cosmetic eyelash serum use should be considered as part of routine questioning when patients present with otherwise unexplained ocular surface symptoms, periocular pigmentation, eyelid contour changes, or alterations in IOP.

Healthcare professionals should specifically inquire about the product name, frequency and duration of use, site of application, and, where possible, the listed active ingredients. This information may be particularly useful when evaluating patients with persistent conjunctival hyperaemia, dry eye symptoms, tear film instability, periocular hyperpigmentation, or features suggestive of prostaglandin-associated periorbitopathy (14,15,29,31,32). Because cosmetic products may contain structurally related or undeclared prostaglandin compounds, obtaining the actual product or a photograph of its ingredient list may be useful when a cosmetic-associated adverse reaction is suspected.

Particular attention should be paid to patients with established glaucoma or ocular hypertension. Although the available evidence does not demonstrate that cosmetic eyelash serums cause glaucoma, direct studies of bimatoprost applied to the eyelid margin have demonstrated modest reductions in IOP, indicating that an ocular hypotensive effect can occur following cosmetic-type application (24,35). In one clinical study of bimatoprost 0.03% gel used for eyelash enhancement, the mean IOP reduction was approximately 2 mmHg after six months, whereas another controlled study found that the mean reduction remained within the range of normal daily IOP fluctuations (24,35).

Therefore, in patients undergoing glaucoma assessment, clinicians should document the use of PGA-containing eyelash products when interpreting IOP measurements. Cosmetic exposure is unlikely to invalidate glaucoma assessment by itself, because glaucoma diagnosis relies on a combination of IOP, optic nerve appearance, retinal nerve fibre layer characteristics, visual field testing, and other clinical findings (27). Nevertheless, awareness of ongoing cosmetic PGA exposure may be important when unexpected IOP changes occur or when measurements are being compared longitudinally.

Patients receiving prescription PGA therapy should also be advised to disclose the use of eyelash-enhancing products. Although additive IOP lowering has not been adequately quantified, concomitant exposure to two sources of prostaglandin-related pharmacological activity could theoretically alter the overall ocular response (28,35). At present, however, there is insufficient evidence to recommend specific treatment modifications solely on the basis of cosmetic eyelash serum use. Instead, the presence of such exposure should be incorporated into the overall clinical assessment.

From a dermatological perspective, the recognition of prostaglandin-associated periocular changes is also important. Progressive periocular darkening, changes in the upper eyelid sulcus, apparent deepening of the superior sulcus, or loss of periocular volume may be mistaken for primary dermatological or age-related changes. Identification of a history of PGA-containing eyelash serum use may therefore provide an important diagnostic clue (14,31,33).

When an adverse reaction is suspected, discontinuation of the suspected product may be considered, followed by clinical reassessment of the ocular and periocular findings. Some adverse effects, including conjunctival hyperaemia and certain pigmentation changes, may improve after discontinuation, whereas structural changes associated with prostaglandin-associated periorbitopathy may require substantially longer periods for recovery and may not always completely resolve (14,33). Importantly, the decision to discontinue a prescription ophthalmic PGA used for glaucoma should remain under the supervision of the treating ophthalmologist and should not be extrapolated from recommendations concerning cosmetic products.

Healthcare professionals should also consider reporting suspected serious or clinically relevant adverse reactions through appropriate national cosmetovigilance systems. Such reporting is particularly important when the product contains a prostaglandin analogue, when the active compound is unclear or potentially undeclared, or when the reaction involves persistent ocular or periocular changes (9–11).

11. Conclusions

Prostaglandin-containing eyelash-enhancing products represent an important example of the increasingly blurred boundary between cosmetics and pharmacologically active products. Prostaglandin-related compounds can produce clinically significant effects on eyelash growth and pigmentation, and bimatoprost has demonstrated established efficacy in the treatment of eyelash hypotrichosis (3,24). However, the same pharmacological mechanisms responsible for their cosmetic efficacy may also produce ocular and periocular adverse effects.

Current evidence supports an association between PGA exposure and a range of adverse effects, including conjunctival hyperaemia, periocular pigmentation, iris pigmentation with ophthalmic use, ocular surface disturbances, and prostaglandin-associated periorbitopathy (14,15,29,31,32). Direct evidence from cosmetic eyelash products remains substantially more limited than evidence from therapeutic ophthalmic use. Nevertheless, the recent prospective study demonstrating alterations in tear film stability and ocular hyperaemia following use of a DDDE-containing eyelash serum provides direct evidence that cosmetic exposure may affect ocular surface parameters (32).

At present, there is no robust evidence establishing that cosmetic prostaglandin-containing eyelash serums cause glaucoma de novo or accelerate glaucomatous optic neuropathy. Similarly, the clinical significance of any IOP-lowering effect associated with cosmetic application remains uncertain. Available evidence indicates that bimatoprost applied to the eyelid margin may produce a modest reduction in IOP, but the magnitude of this effect appears considerably smaller than that expected from therapeutic ophthalmic administration (24,35). These findings support continued clinical awareness without implying that cosmetic PGA exposure is an established cause of glaucoma.

The principal concern therefore lies in the combination of pharmacological activity, chronic unsupervised exposure, variability between formulations, limited compound-specific safety data, and incomplete long-term post-marketing evidence. These concerns are reinforced by recent regulatory assessments. In its 2026 final opinion, the SCCS concluded that the assessed prostaglandin analogues—ethyl tafluprostamide/DDDE, methylamido-dihydro-noralfaprostal, and isopropyl cloprostenate—could not be considered safe for use in cosmetic products intended to promote eyelash or eyebrow growth, primarily because of their potent pharmacological activity and insufficient data to exclude potential adverse effects, including reproductive and developmental toxicity (7,8).

These findings highlight the need for greater transparency regarding the composition and concentration of active ingredients in eyelash-enhancing products, appropriate regulatory scrutiny, and improved post-marketing surveillance. Cosmetovigilance should have a particularly important role in this area because many adverse effects may develop gradually and may not be recognized by consumers as being related to cosmetic exposure. Systematic reporting by healthcare professionals, consumers, manufacturers, and regulatory authorities may help identify emerging safety signals and facilitate the analytical investigation of products suspected of containing undeclared or insufficiently characterized prostaglandin analogues (5,6,9–11).

From a clinical perspective, healthcare professionals should routinely consider cosmetic eyelash products when evaluating unexplained ocular or periocular findings. Greater awareness may facilitate earlier recognition of prostaglandin-associated adverse effects and improve patient counselling regarding the potential risks and uncertainties associated with long-term cosmetic exposure.

Future research should prioritize prospective, long-term studies specifically designed to evaluate cosmetic PGA exposure. Such studies should assess IOP, optic nerve structure and function, ocular surface parameters, tear film stability, meibomian gland function, periocular tissue volume, pigmentation, and systemic exposure. Importantly, investigations should evaluate individual prostaglandin-related compounds separately and should include real-world cosmetic formulations rather than relying exclusively on data from prescription ophthalmic products.

In conclusion, prostaglandin-containing eyelash enhancers may provide effective cosmetic benefits, but their pharmacological activity means that they cannot be regarded as biologically inert cosmetic products. The available evidence supports a cautious approach based on transparent labelling, appropriate regulatory oversight, active cosmetovigilance, and increased awareness among eye-care professionals. While definitive evidence linking cosmetic PGA exposure to glaucoma development is currently lacking, the substantial gaps in long-term safety data justify continued clinical and regulatory attention.

Disclosure

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