

MICROBIAL CONTAMINATION AND PH ASSESSMENT OF  
COMMERCIAL  
ROSE WATER PRODUCTS MARKETED FOR OPHTHALMIC USE IN  
PAKISTAN

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**Abstract**

This study aimed to determine the microbiological contamination, pH, and information provided on the labels of commercially available rose water products for ophthalmic use in Pakistan. The methodology consisted of collecting 13 samples of rose water through convenience sampling from three provinces of Punjab, Sindh, and Balochistan. Eye-related indications and dosage instructions were checked on the product labels. Microbial enumeration was carried out as per United States Pharmacopeia (USP) Bacterial Enumeration Test <61> on tryptic soy agar (TSA), violet red bile agar (VRBA), and Cetrimide agar. Colony characteristics and Gram-stained microscopy were used for preliminary microbial characterization. The pH of the samples was measured with a digital pH meter. The results showed that 9 out of 13 samples were tested for microbial contamination, which is 69.23%, and 4 out of 13 samples showed no microbial growth on the tested media, which is 30.77%. Contaminants consisted of Gram-positive organisms, Gram-negative organisms, and fungal growth. Contaminated samples ranged from 2 to 855 CFU/mL on TSA. Sample pH ranged from 3.22 to 7.51. Only five samples (38.46%) were within the acceptable ophthalmic pH range of 6.5–7.8, whereas eight (61.54%) were below this range. Importantly, none of the 13 products simultaneously met both criteria of absence of microbial contamination and acceptable ophthalmic pH. The results indicate serious safety issues for direct use of the commercial rose water products tested in the eyes. Before being promoted or used for ophthalmic purposes, stronger manufacturing controls, microbiological testing, proper labelling, and regulatory control are necessary.

**INTRODUCTION**

There are stricter microbiological and physicochemical product requirements for products intended for direct ocular use, as the eye is extremely sensitive to contamination and formulation-related irritation. Self-medication is defined in the World Health Organization as the use of medicines for self-diagnosed diseases and/or symptoms, or the continuation of the use of previously prescribed medicines without professional advice (1). The use of one or more medicines without prescription may be part of the practice (2), and recent population-based research in many settings still indicates that it is not uncommon (3). Self-medication can seem like a good idea, but it can result in incorrect treatment, missed or delayed diagnosis, side effects, and antimicrobial resistance (4). In Pakistan, the use and non-prescription sale of antibiotics have also been associated with the rise in antimicrobial-resistant *Salmonella* Typhi (5). A survey of medical students in Karachi revealed significant self-medication (6), and community surveys show the practice in India (7) and Nepal (8). A systematic review recently revealed that self-medication is still prevalent in Pakistan (9). Therefore, the role of self-medication is linked to the unsupervised use of commercially available rose products in the eyes. Moreover, Pakistan's healthcare system incorporates traditional and conventional practices, and the use of herbal preparations is prevalent, with some individuals using them without proper knowledge of any possible side effects (10). The use of traditional medicines is also widespread in other parts of the world (11). In Pakistan, cost, distance, lack of mobility, lack of literacy, older age, and gender-related constraints can be potential barriers to accessing formal eye care (12). Context on eye-care capacity and service needs in the country is also provided in national eye-health documents (13). Concurrently, lack of access to accurate and trustworthy health information can make it more challenging for individuals to discern safe treatment from unsupported or even harmful methods (14).

Self-treatment of the eyes is also especially significant since the patient can use traditional eye

medicines or over-the-counter ophthalmic products prior to seeking professional evaluation. Rose water was used most commonly as an eye medicine in traditional treatment in a study of 117 such patients in Lahore hospital, in which over half of these patients did not improve their symptoms and 12% developed complications (15). Qualitative studies in Pakistan have also recorded that surma, kajal, honey, fennel seeds, almonds, rock sugar, and Arq-e-Gulab (rose water) are used as medicines for common eye complaints (16). Other Pakistani studies have also identified a lack of awareness about visual safety measures (17), misinformation about eye diseases and treatment (18), and continued traditional and self-medication practices for symptoms including redness, irritation, burning, watering, and discharge (19). During outbreaks of conjunctivitis, doctors have specifically warned against unnecessary and unverified eye treatments and advised that any item inserted in the eye must be proven to be safe (20).

Rose water is an aromatic distillate with high water content, which may be susceptible to microbial contamination if the raw materials, processing, packaging, storage, or preservation are inadequate. In these circumstances, bacteria, yeasts and fungi can proliferate and change the quality of the product (21). This risk is more pertinent to the multidose containers that can get multiple exposures during use. FDA guidance for topical ophthalmic drug products thus places particular emphasis on the steps taken to prevent microbial contamination during the product's intended use, including the proper use of preservative if required (22). Therefore, a product which is deemed safe for cosmetic or external application should not be assumed to be safe when instilled into the eye.

Another important factor is the physicochemical compatibility. The pH of tear fluid is around 7.4-7.6, and the ideal pH for ophthalmic formulations is that they match the tear film or are within the ocular comfort range of 6.6-7.8. Products with more acidic or alkaline content could cause lacrimation, pain, and discomfort (23). Microbiological quality and pH should be assessed simultaneously – a product with no detectable

microbes may have an unacceptable pH, and a product with a satisfactory pH may be unsafe due to microbiological contamination.

The evidence in the form of evaluation of commercially available rose water for ophthalmic applications in Pakistan is limited. In a previous study, 11 samples of rose water were collected from the local market of Karachi, and all of them were found to be contaminated with Gram-positive and Gram-negative bacteria (24). Extended evaluation of products from various regions is recommended, as commercial labels may contain claims for conjunctivitis, redness, irritation, inflammation, general eye use, or improvement in vision, but do not provide full dosage and safety data for these conditions.

### Materials and Methods

A total of 13 Samples of Rose water brands available in the market were collected using a convenience sampling method. Samples were purchased from three provinces of Pakistan, i.e Sindh, Balochistan, and Punjab.

Hence, the present study was designed to assess 13 commercially available rose water products obtained from Punjab, Sindh, and Baluchistan. The study examined their label claims, dosage information, quantified the microbial growth on selected culture media, characterized the organisms observed based on their appearance on the culture media and microscopy, and measured the pH of the products. The study was designed to evaluate both microbial quality and pH to see if the products sampled were safe for ophthalmic use according to basic safety criteria and to provide laboratory evidence that could be used for marketing and use of these products in the treatment of common eye complaints.

Sample details with written indications for use in the eye and the recommended dose on their label, along with expiry dates, if available, are given in Table 1.

**Table 1. Sample Details**

| SAMPLE CODE | Mfg / Exp     | Location Sample Collected | Label indicated for Eye ailments        | Dosage                  |
|-------------|---------------|---------------------------|-----------------------------------------|-------------------------|
| P-1         | 06-25/ 06-27  | Punjab                    | No any indication on label              | Not Given               |
| P-2         | 02-25 / 01-28 | Punjab                    | Conjunctivitis                          | 2 drops 4 times         |
| P-3         | 10-24/ 10-27  | Punjab                    | Conjunctivitis                          | Not Given               |
| P-4         | 06-25 / 06-27 | Punjab                    | Conjunctivitis                          | 3-4 drops daily         |
| P-5         | 08-24 / 08-27 | Punjab                    | For EYE use                             | 2 drops , 2 times daily |
| P-6         | 04-25 / 03-27 | Punjab                    | To be use in Eye Not printed on label   | Not Given               |
| S-7         | 11-24 / 12-26 | Punjab                    | Useful for Eye; disease not given       | Not given               |
| B-8         | 05-25 / 04-27 | Baluchistan               | To be used in eye; not printed on label | Not given               |
| B-9         | 05-25/ 05-28  | Baluchistan               | Conjunctivitis                          | Not given               |

|      |               |       |                                                         |                            |
|------|---------------|-------|---------------------------------------------------------|----------------------------|
| S-10 | 04-25 / 04-27 | Sindh | Conjunctivitis                                          | 2-4 drops, 2-4 times daily |
| S-11 | 06-24/ 06-27  | Sindh | Useful in inflammation, irritation, and Redness of eyes | Not given                  |
| S-12 | 09-25 / 08-27 | Sindh | Conjunctivitis                                          | Not given                  |
| S-13 | 04-25 / 03-28 | Sindh | Prevention of Vision                                    | 3-4 drops, thrice daily    |

For determination of total colony-forming units per 1 mL of the samples, USP Bacterial Enumeration Test Procedure < USP 61 > was followed. Meanwhile, for the determination of the

pH of the samples, it was directly checked by using a Mettler Toledo Digital pH meter model Seven Compact.

#### Procedure

Three media, TSA (Generalized), VRBA (for Enterobacteriaceae) and Cetrimide (for Pseudomonas) all from Merck, were prepared and autoclaved. Petri dishes of 90 mm size were also sterilized at 180 C. 1 ml from each sample was added to each petri dish labelled with sample code, under laminar air flow hood cabinet by using sterilized pipette. 20 ml of Each three Media was carefully added to each Petri dish, then plates were allowed to solidify on room temperature. Then the petri dishes along with negative control were

incubated at 33 C for 3 days by using the incubator. In case of the growth colonies observed in the sample, they were counted by using SUNTEX Colony Counter. Then smear of isolated colonies were spread on Glass slides and Gram staining was performed. Colonies were further observed under microscope to determine their microscopy. Results of the test are given in Table 2. Results of the pH values checked with Mettler Toledo Digital pH meter are given in Table 3.

**Table 2. Microbial Results of Samples**

| SAMPLE CODE | Cfu /ml |      |           | Colonial Characteristics (TSA)                     | Microscopy                                |
|-------------|---------|------|-----------|----------------------------------------------------|-------------------------------------------|
|             | TSA     | VRBA | CETRIMIDE |                                                    |                                           |
| P-1         | 207     | NIL  | NIL       | <u>White colour, large, irregular &amp; raised</u> | <u>Gram + ve rods, scattered.</u>         |
| P-2         | 147     | NIL  | NIL       | <u>White, irregular</u>                            | <u>Long Gram-positive rods, scattered</u> |
| P-3         | 66      | 46   | 408       | <u>Yellowish green, shiny, convex, raised</u>      | <u>Gram-negative rods</u>                 |
| P-4         | NIL     | NIL  | NIL       |                                                    |                                           |
| P-5         | NIL     | NIL  | NIL       |                                                    |                                           |

|      |     |     |     |                                                    |                                             |
|------|-----|-----|-----|----------------------------------------------------|---------------------------------------------|
| P-6  | NIL | NIL | NIL |                                                    |                                             |
| S-7  | 800 | NIL | NIL | <u>White, large size cottony</u>                   | <u>Fungal Growth</u>                        |
| B-8  | 855 | NIL | 590 | <u>White colour, medium-sized, raised, shiny</u>   | <u>Gram-negative, short rods in bunches</u> |
| B-9  | 80  | NIL | 25  | <u>White colour, small-sized, rounded, flat</u>    | <u>Gram -ve, short rods in chains</u>       |
| S-10 | 02  | NIL | NIL | <u>Normal to big sized, creamy coloured</u>        | <u>Gram +ve cocci in bunches</u>            |
| S-11 | NIL | NIL | NIL |                                                    |                                             |
| S-12 | 477 | 485 | NIL | <u>White coloured, medium sized, round, smooth</u> | <u>Gram +ve, short rods</u>                 |
| S-13 | 387 | NIL | 23  | <u>Off white, large, circular, flat</u>            | <u>Gram -ve rods</u>                        |

Table 3. pH of Samples

| SAMPLE CODE | pH          |
|-------------|-------------|
| <u>P-1</u>  | <u>4.54</u> |
| <u>P-2</u>  | <u>5.92</u> |
| <u>P-3</u>  | <u>7.51</u> |
| <u>P-4</u>  | <u>6.39</u> |
| <u>P-5</u>  | <u>4.26</u> |
| <u>P-6</u>  | <u>3.22</u> |
| <u>S-7</u>  | <u>7.17</u> |
| <u>B-8</u>  | <u>3.35</u> |
| <u>B-9</u>  | <u>4.70</u> |
| <u>S-10</u> | <u>7.13</u> |
| <u>S-11</u> | <u>4.45</u> |
| <u>S-12</u> | <u>7.40</u> |
| <u>S-13</u> | <u>7.43</u> |

### Results

The 13 commercially available rose water samples were evaluated. The sample details indicated that 7 samples were collected from Punjab, 2 samples from Baluchistan, and 4 samples from Sindh. For all samples, manufacturing and expiry information were available. One sample (P-1) contained no eye use indication on the label. The other samples contained eye-related claims such as for conjunctivitis, general eye use, inflammation,

irritation or redness of the eyes, or vision-related claims. Conjunctivitis was mentioned on six samples: P-2, P-3, P-4, B-9, S-10, and S-12. Dosage instructions were given on 5 samples, and there was no clear indication of dosage instructions on 8 samples (Table 1).

Microbial analysis revealed that 9 samples (69.23%) were microbiologically contaminated, while 4 samples (30.77%) showed no microbial growth on all the tested media. The samples with

no growth on TSA, VRBA, and Cetrimide agar were P-4, P-5, P-6, and S-11 and were classified as contamination-free. Growth was demonstrated on TSA for all contaminated samples, ranging from 2 CFU/ml to 855 CFU/ml. Sample B-8 with a TSA count of 855 CFU/ml was the highest, followed by sample S-7 with 800 CFU/ml, sample S-12 with 477 CFU/ml, and sample S-13 with 387 CFU/ml (Table 2).

Two samples showed growth on VRBA. Sample P-3 had a count of 46 CFU/ml, and sample S-12 had a higher count of 485 CFU/ml. Four samples (P-3, B-8, B-9, and S-13) showed growth on Cetrimide agar. Of these, B-8 had the highest Cetrimide count (590 CFU/ml), followed by P-3 (408 CFU/ml). Lower Cetrimide counts of 25 CFU/ml and 23 CFU/ml were observed in samples B-9 and S-13, respectively (Table 2).

On microscopic examination, 4 contaminated samples had Gram-positive organisms, 4 contained Gram-negative organisms, and 1 had fungal growth. Gram-positive rods were seen in P-1, P-2, and S-12, and Gram-positive cocci in bunches were seen in S-10. P-3, B-8, B-9, and S-13 contained Gram-negative rods. Sample S-7 exhibited white,

large, and cottony growth and was determined to have fungal growth (Table 2).

The pH range of the samples was from 3.22 to 7.51. The lowest pH was recorded in P-6 at 3.22, followed by B-8 at 3.35. The highest pH of 7.51 was observed in P-3. The acceptable range for the ophthalmic pH is 6.5-7.8, with only 5 samples (38.46%) falling within the range. These samples were P-3, S-7, S-10, S-12, and S-13. The remaining 8 samples (61.54%) were found to be less than the lower limit of 6.5. Sample P-4 was found to have a pH of 6.39, which falls slightly below the preferred range (Table 3).

Of the 13 samples, none met both criteria of being free of microbial contamination and having a pH within the ophthalmic range when microbial quality and pH were assessed together. All five samples with pH in the acceptable range indicated microbial growth, and the four samples without microbial growth had a pH value below 6.5. The results of both these tests show that the tested rose water samples were not found to be suitable for ophthalmic use according to both microbiological and pH criteria simultaneously (Tables 2 and 3).

### Discussion

The present study has investigated the microbial quality and pH of 13 commercially available rose water products from various geographical regions of Pakistan. Although most samples contained eye-related label claims, the results indicated that a significant percentage of the products tested are not appropriate for ophthalmic use. Of the 13 samples tested, 12 samples contained some type of eye indication, such as conjunctivitis, eye inflammation or irritation, redness, general eye use, or vision-related claims; several samples gave insufficient dosage information (Table 1). This finding is important since rose water is perceived as a harmless traditional product, but the results of the present study reveal that these products can contain substantial microbiological and physicochemical risks in ocular application.

The high level of microbial contamination detected in the present study reflects the concerns that have been expressed in the literature about

unsafe self-medication practices. The microbial contamination of the present rose water samples was determined to be 69.23% (9 out of 13 samples), and 4 samples (30.77%) were reported as microbiologically contaminated on all the media tested (Table 2). This is of great concern in Pakistan, where self-medication is also reported to be a common practice all over the country. Earlier research has revealed a high prevalence of self-medication in Pakistan, with 68.8% in one study (6) and 64% in a recent systematic review (9). The same pattern has been observed in other neighbouring countries like India (60% prevalence of self-medication) and Nepal (78% prevalence of self-medication) (7,8). The current results reflect this broader regional trend of people taking medicines or traditional remedies without professional advice.

The application of rose water for eye complaints is also in line with a previous study conducted in Pakistan on the use of traditional eye remedies.

Ahmad et al. found that there are various home remedies and traditional medicines used for eye ailments in Pakistan, which are used in several forms such as surma, kajal, honey, saunf, and rose water (16). The use of traditional preparations for eye complaints such as redness, irritation, and burning sensation has also been reported in other studies conducted in Pakistan (17–19). The present study broadens these observations by demonstrating that rose water products marketed or used for these purposes can be contaminated, and their pH may not be acceptable for ocular use. As a result, although previous studies have reported the practice of traditional eye medicines, the current study offers laboratory evidence that this practice can subject patients to unnecessary ocular hazards.

The contamination rate found in this study is similar to, but lower than, the earlier study carried out by Abidi et al. in the local market of Karachi, Pakistan, where bacterial contamination was detected in all 11 rose water samples (24). The present study found contamination in 9 of 13 samples, compared to 4 of 4 samples in the other study. Although the rate of contamination was not 100%, it was high and confirms that microbial contamination of rose water products is a serious quality concern. The similarity between the two studies suggests contamination may not be restricted to one locality, brand, or batch and may be indicative of broader issues of manufacturing quality, storage conditions, packaging, insufficient preservatives, or insufficient regulatory control.

The presence of the various types of organisms observed in the present study further strengthens the concern. Table 2 shows that four samples were contaminated with Gram-positive organisms, four samples with Gram-negative organisms, and one with fungal growth. In samples P-1, P-2, and S-12, Gram-positive rods were observed, and in S-10, Gram-positive cocci in bunches were observed. Samples P-3, B-8, B-9, and S-13 showed the presence of Gram-negative rods. The presence of Gram-negative organisms may be of particular significance because these organisms are associated with serious ocular infections, especially when introduced into a previously inflamed or injured

eye. The growth on Cetrimide agar in P-3, B-8, B-9, and S-13 further increases concerns for the microbiological safety of these products (Table 2). Species-level identification was not undertaken in this study; however, the presence of microbial growth in eye products labelled for the eye is not acceptable for safety reasons.

The clinical relevance of the detection of fungal growth in sample S-7 is also important. The presence of fungal contamination in an eye product is extremely unfavorable because fungal eye infections can be difficult to treat and can cause serious complications if the diagnosis and treatment are delayed. This is especially crucial in areas where individuals might try home treatment before consulting a physician. Tariq et al. reported that self-medication as a first-line treatment in ophthalmology patients can lead to complications and postponement of proper treatment (15). The current study corroborates this concern, as a contaminated traditional eye product could worsen the eye infection or add new pathogens to the eye issue, and not resolve the original problem. The pH value results also reveal that many samples are unsuitable for ophthalmic applications. The range of pH values varied between 3.22 and 7.51, with significant variation among the products tested (Table 3). Eye drops should have an acceptable pH range of 6.5–7.8, with normal tear fluid having a pH of 7.4 (23). Among the 10 samples collected, only 5 (38.46%) samples fell within this acceptable zone, and 8 (61.54%) samples were below the lower acceptable limit of 6.5 (Table 3). The pH values of samples P-6 and B-8 were 3.22 and 3.35, respectively, and were highly acidic. Such acidic products may cause burning, tearing, discomfort, irritation, and reflex lacrimation when instilled into the eye. Thus, even if a product is not microbially contaminated, it may be inappropriate if it is incompatible with the ocular surface due to its pH.

The combined analysis of microbial contamination and pH provides the most important finding of this study. Of the 13 samples, none met both the requirements of a contamination-free sample and an acceptable ophthalmic pH. All five samples with acceptable

pH values were found to be contaminated with microorganisms, whereas the four samples that did not show any microbial growth had pH values below the acceptable ophthalmic range (Tables 2 and 3). Therefore, none of the tested products were found suitable for safe use in the eye, according to the two parameters studied. The finding is especially alarming given that many of these products were indicated for the eyes or other eye-related conditions (Table 1).

The results also emphasize the importance of appropriate preservation and quality control of rose water products. Mahboubi and Lu noted that with high water content, rose water can be prone to microbial growth if proper preservation and manufacturing procedures are not followed, so it was important to ensure quality control (21). Likewise, FDA guidance for topical ophthalmic drug products states that for multidose products, the product must be protected from microbial contamination during use by providing suitable measures such as preservatives if necessary (22). The present study reveals that some of the commercially available rose water products do not contain such expectations, particularly if marketed for eye use.

The results of these findings should be interpreted in the context of the barriers to formal eye care in Pakistan. Malik et al. found that various factors make access to eye care facilities difficult for people in Pakistan, such as illiteracy, finances, distance from health care facilities, mobility problems, and female gender (12). These barriers can make patients more likely to resort to traditional remedies, a pharmacy product, or an over-the-counter product when seeking ophthalmic care from qualified professionals. In outbreaks of conjunctivitis, there may be increased demand for rose water eye drops, and these products may be sold at an elevated price, possibly without adequate quality and safety measures (20). In this context, contaminated or acidic rose water products can reinforce the threats to public health by promoting a delay in diagnosis or inappropriate treatment.

The problem is compounded by the presence of misinformation and the acceptance of traditional

remedies by the people. Alkhairy et al. reported that misinformation about eye diseases and their treatment exists within the general population, and other studies have documented the use of traditional and self-medication practices for the treatment of common eye ailments (18,19). This present study shows laboratory evidence that corroborates these concerns. Products identified as safe due to their natural or traditional origin are not necessarily safe for the eyes until they are manufactured according to specific requirements and tested for sterility, pH, stability, and preservative effectiveness.

Another concern is the labelling of tested samples. There were multiple claims for usefulness in conjunctivitis, eye inflammation, irritation, redness, or vision improvement, but the laboratory results indicated that they were not safe for these uses (Tables 1–3). Consumers may be misled by these claims into treating eye disease with rose water rather than with an ophthalmologist. This is particularly alarming, since the World Health Organization characterizes self-medication as the application of drugs to manage self-diagnosed symptoms or the ongoing use of drugs which were previously prescribed by a professional without consulting them (1). This is potentially harmful in eye disease due to the possibility of causing redness and irritation caused by any infection, allergy, corneal disease, intraocular inflammation, or simple conjunctivitis.

This study has some limitations. Convenience sampling was adopted, and the number of samples was limited to 13. Hence, the results might not be reflective of all rose water products available in Pakistan. Microbial identification was done by colony characteristics and microscopy, without species-level identification or antimicrobial susceptibility testing. The study also focused on pH and microbial contamination alone; other tests like sterility testing, preservative content, osmolarity, endotoxin testing, and stability were not performed. Future studies should employ larger sample sizes of each brand, multiple batches of each brand, wider geographic sampling, species-level microbial identification, and detailed

assessment by ophthalmic product quality standards.

### Conclusion

The present study found that commercially available rose water products marketed for eye use may pose important safety risks. Of 13 samples tested, 9 samples contained microbial contamination, which included Gram-positive bacteria, Gram-negative bacteria, and fungal growth, and only 4 samples were free from microbial contamination. The pH results were also below acceptable standards, with only 5 samples within the ophthalmic range of 6.5–7.8, and several samples were very acidic, which can lead to instillation discomfort, tearing, irritation, and even burning. Importantly, all samples failed to satisfy both of the key safety criteria – absence of microbial contamination and satisfactory pH. This is concerning because the majority of the products sold have labels that make claims related to conjunctivitis, eye irritation, redness, inflammation, or vision improvement. For this reason, rose water should not be used directly in the eyes without undergoing manufacturing, testing, labelling, and regulation to meet appropriate ophthalmic quality standards prior to promotion or sale for common eye complaints.

### REFERENCES

1. World Health Organization. Guidelines for the regulatory assessment of medicinal products for use in self-medication. 2000;14(1):18
2. Lifshitz A, Arrieta O, Burgos R, Campillo C, Celis MÁ, Llata M, et al. Self-medication and self prescription. *Gac Med Mex*. 2020;156(6):600-602. Doi: 10.24875/GMM.M21000456 )
3. Sawsan M. A. Abuhamdah, Abdallah Y Naser .Self-medication practice among the general public in Jordan: a cross-sectional study. *Front. Public Health*, 17 October 2024. Volume 12 - 2024 | <https://doi.org/10.3389/fpubh.2024.1433464>
4. Bennadi D. (2013). Self-medication: A current challenge. *Journal of basic and clinical pharmacy*, 5(1), 19–23. <https://doi.org/10.4103/0976-0105.128253>
5. Shaikh OA, Asghar Z, Aftab RM, Amin S, Shaikh G, Nashwan AJ. Antimicrobial-resistant strains of *Salmonella typhi*: The role of illicit antibiotics sales, misuse, and self-medication practices in Pakistan. *Journal of Infection and Public Health*.2023Oct; 16(10): 1591-7.
6. Farooqi UG, Khan FA, Iqbal J, Khalid AY, Saleem MA, Mustafa G. A Cross-Sectional Survey to Evaluate SelfMedication Among Medical Students in Karachi, Pakistan. *Journal of Positive School Psychology*. 2023 Mar; 2: 1178-82.
7. Rathod P, Sharma S, Ukey U, Sonpimpale B, Ughade S, Narlawar U, et al. Prevalence, Pattern, and Reasons for Self-Medication: A Community-Based CrossSectional Study from Central India. *Cureus*. 2023 Jan; 15(1): 1-7. doi: 10.7759/cureus.33917
8. Ghimire P, Pant P, Khatiwada S, Ranjit S, Malla S, Pandey S. Self-medication practice in Kathmandu Metropolitan City: A cross-sectional study. *SAGE Open Medicine*. 2023 Mar; 11: 1–8. doi: 10.1177/20503121231158966.
9. Saifullah et al. Prevalence and patterns of self-medication in Pakistan: a systematic review and meta analysis. *BMC Public Health* (2026) 26:232. <https://doi.org/10.1186/s12889-025-25978-x>
10. BUSHRA HINA ; Health Risk Associated by Traditional and Complementary Medicines (T&CM) with Special Reference to Herbal Medicines Either Used Alone or Concomitant with Conventional Pharmaceuticals. *Liaquat National Journal of Primary Care* 2023; 5(2): 112-117.

11. Pan SY, Litscher G, Chan K, Yu ZL, Chen HQ, Ko KM. Traditional medicines in the world: where to go next? Evid Based Complement Alternat Med 2014;2014. doi: 10.1155/2014/739895.
12. Manal Malik , Niall Strang , Aiman Hafeez , Mujtaba Shabbir , Farah Iftikhar , Sven Jonuscheit. Barriers to accessing eye care in Pakistan: a mixed methods study. Primary health care research & development. 2025 Jul 15;26:e58. doi: 10.1017/S1463423625100261
13. Seva Foundation. Pakistan Fact Sheet. 2023. Available from: [https://www.seva.org/pdf/Seva\\_Country\\_Fact\\_Sheets\\_Pakistan.pdf](https://www.seva.org/pdf/Seva_Country_Fact_Sheets_Pakistan.pdf)
14. Godlee F, Pakenham-Walsh N, Ncayiyana D, Cohen B, Packer A. Can we achieve health information for all by 2015? The Lancet 2004; 364(9430): 295-300. DOI: [https://doi.org/10.1016/S0140-6736\(04\)16681-6](https://doi.org/10.1016/S0140-6736(04)16681-6).
15. Self-medication as an Initial Treatment and its Associated Complications in Ophthalmic Patients at Al-Khidmat Teaching Hospital, Mansoorah, Lahore, Pakistan Farah Tariq<sup>1</sup> , Muhammad Mateen Amir<sup>2</sup> , Zahid Mehmood<sup>3</sup> , Anwar-ul-Haq Hashmi *////* Pak J Ophthalmol. 2024, Vol. 40 (3): 296-301
16. Khabir Ahmad, Mohammad Aman Khan, Mohammad Babar Qureshi, Mohammad Daud Khan, Azam Ali, Clare Gilbert. Use of Home Remedies and Traditional Medicines for the Treatment of Common Eye Ailments in Pakistan: A Qualitative Study. Pak J Ophthalmol 2009 Vol. 25 No. 1
17. Ambar Haseena ,Mashal Mumataz, Syeda Hamna Saeed Gillani ; AWARENESS OF VISUAL SAFETY MEASURES IN RURAL AREAS OF PAKISTAN. Volume 11 Issue 2 OPTHALMOLOGY PAKISTAN 2021.
18. Saba Alkhairy , Farnaz Siddiqui<sup>1</sup> , Muhammad Nizamuddin et al. An Assessment of the State of Misinformation Regarding Eye Diseases and their Treatment in the General Public. Liaquat National Journal of Primary Care 2023; 5(1): 9-14
19. Sami Uddin , Muhammad Tariq Khan , Benish Fatima Ali Haris , Sapna , Nauman Uddin , Fazl E Manan. Traditional and Self-Medication Practice for Common Eye Ailments. Journal of Clinical and Community Ophthalmology 2023, Vol 01, Issue 1, 28-34.
20. Asghar RJ. From Pink Eye to Blindness .The Express Tribune ; 2023. Available from : <https://tribune.com.pk/story/2438104/>
21. Mohaddese Mahboubi<sup>1</sup>, Shao Hua Lu. Rose water, quality control, and its application. J. Med. Plants 2024; 23(91): 1-15
22. FDA Quality Considerations for Topical Ophthalmic Drug Products Guidance for Industry. Dec 2023.
23. Freiberg JC, Hedengran A, Heegaard S, Petrovski G, Jacobsen J, Cvenkel B, et al. An Evaluation of the Physicochemical Properties of Preservative-Free 0.005% (w/v) Latanoprost Ophthalmic Solutions, and the Impact on In Vitro Human Conjunctival Goblet Cell Survival. J Clin Med. 2022;11(11).
24. Safia Abidi, Mufra Hasan, Aneela Mehboob, Tanveer Abbas, Iqbal Azhar and Zafar Alam Mahmood . Evaluation of microbial contamination in rose water samples extracted from Rosa damascene petals. Journal of Pharmacognosy and Phytochemistry 2021; 10(2): 142-144
25. Javed, M. A., Saeed, M., Zeb, I., Aqeel, A., Gurganari, L., & LMO, S. P. (2026). Genomic Surveillance and Epidemiological Modeling of Antimicrobial Resistance (AMR) in Urban Hospital Effluents. *Pakistan Journal of Medical & Cardiological Review*, 5(2), 644-654

26. B Ishaque, W Ahmad, QA Sultan, A Aqeel, M Imran, K Khan, TT Bashir, M Hasan. (2025). High pressure processing (hpp) and its impact on microbial safety texture of ready-to-eat products. Pakistan Journal of Medical & Cardiological Review.

27. M Nazir, MAA Talpur, SA Lashari, A Aqeel, QA Sultan. (2025). Mathematical Modeling of Thermal Death Kinetics of Bacteria and Spores in Ready-to-Eat and Minimally Processed Foods. Global Research Journal of Natural Science and Technology. Volume: 03 -Issue 4.

28. Ashraf, A., Sultani, M. A., Atique, M. S., Qureshi, M., & Shayan, T. J. (2026). Exploring Graphene-Enhanced Quantum Materials and Superconducting Heterostructures for Advanced Batteries and Sustainable Fusion Energy Technologies. Sch Acad J Biosci, 14(8), 555-581. doi.org/10.36347/sajb.2026.v14i08.004

Nazim Nazir. (2022). Intelligent fault diagnosis and resilient control of safety-critical industrial systems using explainable AI. Journal of Information Systems Engineering and Management, Volume 7 ([Issue-4 ]), [pages-12]. DOI-15\_Intelligent\_Fault\_Diagnosis.pdf