International Journal of Medical Toxicology & Legal Medicine Volume 27, No. 4, 2024
e-ISSN: 0974-4614
p-ISSN: 0972-0448

Investigating incidence of fungal contamination in cosmetic tools used by female students of Al-Kufa university in Al-Najaf, Iraq

Manar Kareem Alquraishy[1*], Rukaya Saad Al-Abeadi[1], Ahmed Adnan AL-Khafagi[2]

[1]College of Health and Medical Techniques/Kufa, Al-Furat Al-Awsat Technical University, 31003 Al-Kufa, Iraq
[2]Anesthesia Techniques Department, College of Health and Medical Techniques, Al-Mustaqbal University, 51001, Babylon, Iraq
Email:manar.fadelckm@atu.edu.iq, ruqaya.saad1.chm@atu.edu.iq, ahmed.adnan.abdalameer@uomus.edu.iq
*Corresponding Author

Received: 18.08.2024 Revised: 13.09.2024 Accepted: 07.10.2024

ABSTRACT
Background: Fungal can cause a variety of infections such as skin and eye diseases, and infections may occur spread among women due to sharing salon utensils or cosmetic tools.
Objective: This study was proceeded to evaluation the fungal contamination in the personal cosmetic tools used by female students of Al-Kufa university in Al-Najaf, Iraq.
Methods:120 samples of cosmetic tools were included in this descriptive study. They collected randomly from women which include beauty blender, lipstick, mascara, eyeshadow brush, concealer brush, eyebrow brush and makeup sponge. All the samples were cultured on potato dextrose agar (PDA) and examined macroscopically and microscopically after the incubation by staining in lactophenol. Data were analysed using SPSS 18 software.
Results: It was observed that there are seven species of fungi isolated from the different cosmetic tools, which include Mucor spp., Rhizopus spp., Penicilliumspp. ,Aspergillusniger, Candida albicans, Trichophytonmentagrophytes and Aspergillusfumigatus. The major contaminated tools were the beauty blender and makeup sponge samples followed by lipstick and eyeshadow brush.
Conclusion: Therefore, we found that cosmetic tools, especially beauty blender, makeup sponge, lipstick and eye shadow brush are contaminated by fungi and need more awareness.

Keywords: Contamination, Cosmetic tools,Fungi,Isolation, Al-Najaf

1. INTRODUCTION

Lately, makeup is extensively used to enhance the beauty of women. When women use cosmetic tools, they spread a variety of harmful microorganisms, particularly fungi and bacteria that cause infections in their skin and eyes (Helaskoskiet al., 2014). In addition, it was reported that 44% of cosmetic users experience side effects of fungal contamination (Nayaket al., 2023). Minerals, growth factors, organic and inorganic composites, and humidity that provide a suitable environment for fungal and microbial growth are introduced in cosmetics. However, detecting fungi contaminants in cosmetics and beauty appliances on decorative ware is difficult (Asbellet al., 2018). Cosmetic tools can be contaminated in different ways, such as from the use of undisclosed substances during production, during the manufacturing process, or while using the cosmetic tools. Microorganisms (fungi, bacteria, …) are found widely, including on skin and shells. Because they are continuously released into the environment, they can easily spread between passengers and drivers through contact with contaminated hands, clothing, or body fluids such as blood (Alshehrei, 2023). Endotoxins and other metabolites of fungi contaminants can irritate the skin and trigger allergic reactions (Kumar et al., 2021). It may also be a pathogen harmful to human health (Osiloet al., 2023).
Microorganisms can live in an environment that meets their chemical and physical needs for growth and reproduction. The pH of the environment and the corresponding temperature are the most important physical requirements. In chemical microorganism, microorganism require air, readily available food, and a moist environment to thrive, which is provided by rich texture of the cosmetic tools (Dadashi et al., 2016). However, disposable cosmetic tools along with disinfectants, awareness may be useful approach to reduce these contaminants (Nayak et al. 2023; Dadashi et al., 2016).
The study's goals aimed to evaluate the prevalence of fungal contamination in the personal cosmetic tools used by female students of Al-Kufa university in Al-Najaf, Iraq.

2. MATERIALS AND METHODS

2.1 Research design

A total of 120 samples were gathered at random from cosmetic tools using by female students of Al-Kufa university in Al-Najaf, Iraq (Table 1).

2.2 Collection sample

To determine the variety of fungus present, remove cotton swabs from beauty blenders, lipstick, mascara, eyeshadow brushes, concealer brushes, eyebrow brushes, and makeup sponges. To prevent pollution, the swab is properly labeled and returned to the cap after each sample collection. Each sample collected was immediately sent to the microbiology laboratory and cultured using routine methods.

2.3 Microbial isolation and identification

They were implanted on dishes containing the culture medium (PDA) and then incubated for the purpose of laboratory diagnosisfor3-7 days at 28 ℃**.** Macroscopical and Microscopical examination tests were performed to identify the types of fungi. These tests were performed as described previously by Alshehrei(2023). Briefly the fungal colonies were stained by lactophenol blue using Scotch Tape Method to determine the microscopic characteristics. In addition, the morphological characteristics of fungal filaments were identified with appearance, taxonomic keys and reference literature. The incidence of each fungal was expressed as a percentage of total (Alshehre,2023).

Table 1. The samples were collected for study.

Sample types	**Number of samples**
Beauty blender	27
Lipstick	18
Mascara	12
Eyeshadow brush	27
Concealer brush	9
Eyebrow brush	9
Makeup sponge	18

2.4. Statistical analysis

Data were analysed by SPSS 18. The Kolmogorov-Smirnov test was used to confirm the normal distribution of variables. A number and frequency percentage were applied for describing the variables.

3. RESULTS

In our currently study the result of macroscopical and microscopical examination observed there are seven isolates of fungi in different types of samples which diagnosed, include Mucor spp., Rhizopus spp.,Penicilliumspp.,Aspergillusniger, Candida albicans, Trichophytonmentagrophytes andAspergillusfumigatus (Table 2). The result observes the present of Mucor spp., Rhizopus spp.andPenicilliumspp.asa highest ratio which reached to 20%. Followed by Aspergillusnigerat 17.5%, Candida albicansat 12.5%. While the less contaminated fungi represented by Trichophytonmentagrophytes andAspergillusfmigatusat ratio 5%. While table 3 show that the beauty blender and makeup sponge were represent the most contaminated samples followed by lipstick and eyeshadow brush.

Table 2. The percentage of each fungi isolated from different samples.

No.	Types of fungi	Percent of type (%)
1	Mucorspp.	20
2	Rhizopusspp.	20
3	Penicilliumspp.	20
4	Aspergillusniger	17.5
5	Candida albicans	12.5
6	Trichophytonmentagrophytes	5
7	Aspergillusfmigatus	5

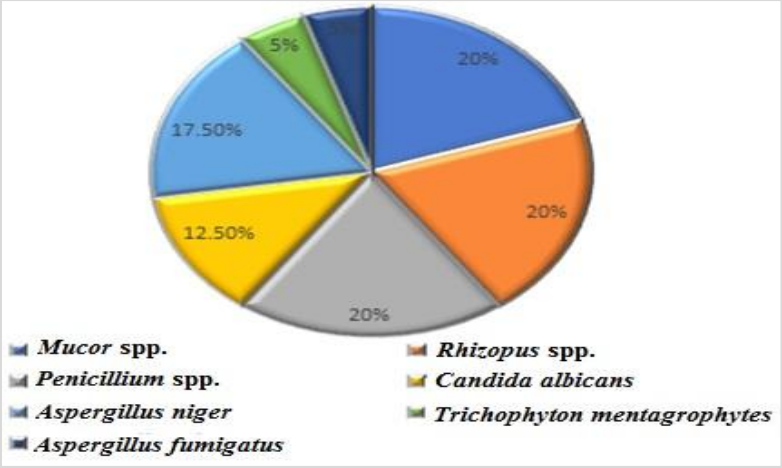

Figure 1. Percentage of each fungus isolated from different samples.

Table 3. Fungi isolates contaminating the cosmetic tools.

Fungi	Beauty blender	Lipstick	Mascara	Eyeshadow brush	Concealer brush	Eyebrow brush	Makeup sponge
Mucorspp.	+	-	-	+	-	-	+
Rhizopusspp.	-	-	-	+	-	-	+
Penicilliumspp.	+	-	-	-	-	-	+
Aspergillusniger	-	+	-	-	-	+	-
Candida albicans	-	+	+	-	-	-	-
Trichophytonmentagrophytes	+	-	-	-	-	-	+
Aspergillusfmigatus	-	-	-	-	+	-	-

(+) positive= growth of fungi, (-) absence of fungi**.**

4. DISCUSSION

Our results showed that the most diagnosed contaminating fungi are saprophytic or opportunistic fungi such as Aspergillusniger, Mucorspp., Rhizopusspp., Penicilliumspp. and Candida albicans. The previous study showed that some contaminating fungi such as Rhizopusspp., Mucorspp.,Aspergillusniger, and Penicilliumspp.in sterilized and un sterilized various type of nuts. Morevere, these genera are observed in many of crops, agricultural products and foods (AL-Warshan et al., 2022). It seems that humidity, manufacturing process, environment dust, and contamination of raw materials are help to growth of these fungus (Alshehrei, 2023). Likewise, these genera of fungus have shown strong resistance against antifungal drugs (Sriramajayam et al., 2023). Candida albicans which are able to proliferate as filamentous hyphae or yeast cells. The most prevalent fungus causing disease in humans is Candida albicans, which grows in the host as both mold and yeast. Comparative description of the yeast and mold forms that colonize the skin and mucous membranes before invading the bloodstream and deep tissue (Netea et al.,2015). Candida albicans can cause a variety of infections such as skin and eye diseases in beauty salons, and infections may occur spread among women due to sharing salon utensils or cosmetic tools (Dadashi, L. &Dehghanzadeh 2016). Accordingly, several studies have also isolated Aspergillusspp. and Penicilliumspp. from cosmetic tools and products as the most observed fungi with prevalence of 57% and 29%, respectively (Alshehrei et al., 2023; Stanley et al., 2019). 2007).

The results of this study indicate that contamination with fungi may be due to several reasons, including the contamination of some cosmetic products used by women with microorganisms. Many studies have been conducted on evaluation the microorganisms in cosmetic products, their conclusion that certain products have fungal and bacterial contamination. This is because the ingredients in these products include substances that are thought to promote the growth of bacteria and fungus (Alshehrei, 2023; Dadashi&Dehghanzadeh, 2016).

Makeup ingredients are rich in supplements and provide elemental substrates for microbial growth, such as sugar, starch, protein, amino acids, organic acids, alcohols, lipids and other material. Microorganisms can grow on almost any substance found in nature and can even attack and break down them (Alshehrei, 2023). Additionally, untreated or non-sterile water promotes the growth of microorganisms that desecrate cosmetics, as water is a prerequisite for all bacteria that may contaminate products (Alshehrei, 2023). In addition to the nature of the forms or materials from which cosmetic tools and cosmetic materials are manufactured, which allow the retention or growth of microorganisms, in addition to ignoring proper cleaning and sterilization to eliminate them or change them from time to time, and the wrong methods for storing these tools, most of the time women

keep some cosmetic tools and materials in personal bags randomly, which provides an environment contamination with microbes (Noor et al., 2020).

Many women suffer from many skin problems that may be the result of contamination with the cosmetics or cosmetics that they use. When consulting a specialist doctor, the source of the infection may be ignored or the infection may not be linked to the cosmetic tools. From this standpoint, this study provides important information about the potential risks that may be caused by contaminated cosmetic tools. Therefore, women must be educated about the necessity of cleaning and sterilizing cosmetic tools before and after use to remove organic materials and other residues, change these tools from time to time, and be careful not to share them with others.

5. CONCLUSION

Overall, this study showed the fungal contamination of cosmetic tools used by female students of Al-Kufa university in Al-Najaf, Iraq. It seems that contamination be more present in beauty blender, sponges, lipsticks and eyeshadow brushes. For users, it is recommended to sterilize these tools by a disinfectant and do not use public.However, further studies with more relevant evidence are needed to awareness and reduce fungal contamination of cosmetic tools.

Authorship contribution

MKA: Participation in the study design and project administration, analysis, writing, or revision of the manuscript. RSAl-A: Data collection and writing. AAAL-K: Consultant, data analysis, and Writing. All authors read and approved the final manuscript.

Conflicts of interest

The authors declare no conflict of interest.

Acknowledgments

This trial has been supported by Al-Furat Al-Awsat Technical University, 31003 Al-Kufa, Iraq.

REFERENCES

1. Alshehrei, F.M. (2023).Isolation and Identification of Microorganisms associated with high-quality and low-quality cosmetics from different brands in Mecca region-Saudi Arabia. Saudi Journal of Biological Sciences, 30 (2023), 103852.
2. Al-Warshan, S.H., Abed, M.M., Mohammed, M.M. (2022). Detection of Fungi Contaminated some Nuts and Its Ability for Aflatoxin B1 Production. InIOP Conference Series: Earth and Environmental Science, 1060(1), 012086.
3. Asbell, P.A., Sahm, D.F., Shaw, M., Draghi, D.C. , Brown, N.P. (2018). Increasing prevalence of methicillin resistance in serious ocular infections caused by Staphylococcus aureus in the United States: 2000 to 2005. Journal of Cataract & Refractive Surgery, 34(5), 814-8. https://doi.org/10.1016/j.jcrs.2008.01.016
4. Dadashi, L., Dehghanzadeh, R. (2016). Investigating incidence of bacterial and fungal contamination in shared cosmetic kits available in the women beauty salons. Health promotion perspectives, 6(3), 159-63. doi: 10.15171/hpp.2016.25.
5. Helaskoski, E., Suojalehto, H., Virtanen, H., Airaksinen, L., Kuuliala, O., Aalto-Korte, K., &Pesonen, M. (2014). Occupational asthma, rhinitis, and contact urticaria caused by oxidative hair dyes in hairdressers. Annals of allergy, asthma & immunology, 112(1), 46-52. https://doi.org/10.1016/j.anai.2013.10.002
6. Kumar, P., Kausar, M. A., Singh, A. B., & Singh, R. (2021). Biological contaminants in the indoor air environment and their impacts on human health. Air Quality, Atmosphere & Health, 14(11), 1723-1736.Netea, M. G., Joosten, L. A., Van Der Meer, J. W., Kullberg, B. J., & Van De Veerdonk, F. L. 2015. Immune defence against Candida fungal infections. Nature Reviews Immunology, 15(10), 630-642.
7. Noor, A. I., Rabih, W. M., Alsaedi, A. A., Al-Otaibi, M. S., Alzein, M. S., Alqireawi, Z. M., ... &Alfaran, H. S. (2020). Isolation and identification of microorganisms in selected cosmetic products tester. African Journal of Microbiology Research, 14(9), 536-540. https://doi.org/10.5897/AJMR2020.9399
8. Sriramajayam, L., Kaur, R., Dhakad, M.S. and Gulati, A., 2023. Antifungal Resistance Profile of Fungal Isolates from Fungal Rhinosinusitis Patients: A Study from Tertiary Care Hospital. Journal of Laboratory Physicians, 15(04), 488-492.
9. Stanley, H. O., Oba, T. T., &Ugboma, C. J. (2019). Evaluation of microbial contamination of combs and brushes in beauty salons within the University of Port Harcourt, Rivers State, Nigeria. Archives of Current Research International, 16(2), 1-7. https://doi.org/10.9734/acri/2019/v16i230088