



## Fungal Infections and Health Literacy: The Media in Community Health Awareness

 Ayşe KALKANCI

Department of Medical Microbiology, Faculty of Medicine, Gazi University, Ankara, Türkiye

### Abstract

Fungal infections are increasingly recognized as a pressing issue due to their substantial morbidity and mortality, particularly in immunocompromised populations. The emergence of antifungal resistance underscores the need for robust surveillance and effective community-based prevention strategies. Despite this burden, public awareness and understanding of fungal diseases remain limited, reflecting the critical role of health literacy in shaping health behaviors and outcomes. “Health literacy (HL) refers to the ability of individuals to access, comprehend, interpret, and apply health-related information; inadequate HL contributes to misconceptions, delayed health-seeking behavior, and poor treatment adherence. Media plays a pivotal role in shaping community perceptions by producing and disseminating health information. The transition from traditional to digital and social media has expanded access to diverse health messages, but it has also increased the risk of misinformation. Media literacy is therefore essential to empower individuals and communities to critically assess health messages and to make informed health decisions. This review explores the epidemiology of fungal infections, the influence of health literacy on diagnostic and treatment pathways, and the media’s role in constructing public perceptions. It emphasizes the integration of health and media literacy as a strategy to improve community health outcomes. Drawing on national and international examples, the paper highlights the impact of media on public health and provides recommendations for strengthening accurate information dissemination and health education within communities.

**Keywords:** Fungal infections; health literacy; media literacy; community health; public health education

## Introduction

Fungal infections are increasingly recognized as a major public health concern, particularly due to their high morbidity and mortality among immunocompromised individuals. In recent years, the rise in antifungal resistance has necessitated closer global surveillance of these infections. At the same time, the generally low level of public knowledge about fungal diseases underscores the critical importance of health literacy (HL) (Moore, 2023).

Health literacy (HL) is defined as the ability of individuals to access, understand, interpret, and appropriately apply health-related information. Inadequate HL contributes to the persistence of misconceptions, delays in seeking medical care, and poor adherence to treatment (Sorensen, 2012). In this context, the media occupies a central role in the production and dissemination of health information, shaping public perceptions. The shift from traditional to digital and social media platforms has greatly increased both the volume and diversity of health messages to which individuals are exposed (Kickbusch, 2008).

However, this abundance of information also raises the risk of encountering false or distorted content. Media literacy enhances individuals' ability to critically evaluate health-related messages and to identify reliable information (European Health Policy Forum, 2005). Therefore, understanding the intersection of HL and media literacy is essential to ensure accurate public perceptions of fungal infections.

This narrative review aims to develop a conceptual understanding of the interplay between fungal infections, HL, and media literacy, and to evaluate how this triad influences public perceptions, healthcare utilization, and clinical outcomes, with implications for public health strategies and misinformation control. This review explores the epidemiological features of fungal infections, the role of HL in their diagnosis and treatment, and the perceptions shaped by media. It further highlights the importance of media literacy within this process. Drawing on national and international examples, the paper discusses the impact of media on public health and offers recommendations for strengthening accurate information dissemination to society.

## Methods

This study was conducted as a narrative review. A comprehensive literature search was performed using major electronic databases including PubMed, Scopus, and Web of Science. Additional sources such as reports from international health organizations (e.g., WHO, CDC) and relevant media examples were also reviewed. The search was limited to publications in English between 2000 and 2025. Keywords included combinations of "fungal infections," "health literacy," "media literacy," "public health," "misinformation," and "community awareness." Studies were selected based on their relevance to the epidemiology of fungal infections, the role of HL in health outcomes, and the influence of media on public perceptions. Both original research articles and review papers were considered. Media examples were included if they illustrated the impact of media narratives on public understanding of fungal diseases. No formal systematic review protocol or meta-analysis was applied, consistent with the narrative nature of the study.

### *One Health Perspective*

The "One Health" concept recognizes human health is closely interconnected with animal health and the environment. In the context of fungal infections, this approach is particularly relevant, as many fungal pathogens originate from environmental reservoirs such as soil, water, and air, and their transmission dynamics are influenced by climate change, agricultural practices, and antifungal use in both human and veterinary medicine.

Environmental factors, including rising temperatures and humidity, contribute to the expansion of fungal habitats and the emergence of resistant strains. The widespread use of antifungal agents in agriculture, particularly azoles, has been linked to the development of resistant *Aspergillus fumigatus* strains that can infect humans. In addition, animals may act as carriers or sentinels for emerging fungal pathogens, further emphasizing the interconnected nature of these systems.

From a public health perspective, addressing fungal infections within a One Health framework requires integrated surveillance systems, coordinated antimicrobial stewardship across sectors, and interdisciplinary collaboration among clinicians, veterinarians, environmental scientists, and public health professionals. Importantly, health and media literacy play a crucial role in this framework by shaping how communities understand environmental risks, interpret health information, and adopt preventive behaviors.

### *Epidemiology of Fungal Infections*

Fungal infections represent a substantial and growing global health burden, with an estimated 6.5 million cases of invasive fungal infections (IFIs) annually, resulting in approximately 2.5 million deaths worldwide

(Chamorro, 2025). The most common pathogens include *Candida* species, *Aspergillus fumigatus*, *Cryptococcus neoformans*, and members of the order Mucorales, which have been classified by the World Health Organization as “critical priority” pathogens (WHO and Narayanan, 2025). For example, invasive candidiasis is associated with a crude mortality rate of 30-50%, while invasive aspergillosis may exceed 50% mortality in immunocompromised patients. Cryptococcal meningitis alone is responsible for nearly 180,000 deaths per year, particularly in low- and middle-income countries. Superficial fungal infections are even more widespread, affecting nearly 20-25% of the global population, with dermatophyte infections being the most common. Although rarely fatal, these infections contribute significantly to morbidity, healthcare utilization, and reduced quality of life. A major and escalating concern is the emergence of antifungal resistance, which complicates both treatment and control strategies. Resistance to azole antifungals, particularly in *Aspergillus fumigatus*, has been increasingly reported, with environmental resistance rates reaching up to 10-15% in some regions (Swain, 2025). Data from Türkiye further reveal that triazole resistant *A. fumigatus* strains account for up to 7% of clinical isolates, adversely affecting therapeutic outcomes (Ener, 2022). Additionally, recent detections of *Candidozyma (Candida) auris* cases in Türkiye reflect global epidemiological trends (Ağalar, 2025).

Among patients with hematological malignancies or those undergoing hematopoietic cell transplantation, the incidence of invasive fungal disease ranges from 3-10%, with *Aspergillus* and *Candida* being the predominant etiologic agents (Quattrone, 2025 and Popova, 2025). During the COVID-19 pandemic, there was also a notable increase in cases of COVID-19-associated pulmonary aspergillosis (CAPA) and mucormycosis (Pagano, 2025). Similarly, multidrug-resistant *Candidozyma (Candida) auris* has emerged as a global health threat due to its high transmissibility, persistence in healthcare settings, and resistance to multiple antifungal classes.

Superficial fungal infections similarly constitute a significant global burden. Dermatophyte-related tinea infections are estimated to affect nearly one-quarter of the world’s population. Climate change, high humidity, and rising temperatures contribute to the spread of dermatophytes and accelerate antifungal resistance (Gupta, 2025). In Türkiye, fungal infections likewise impose an increasing clinical and public health burden. Superficial dermatophyte infections are the most frequently reported, with tinea capitis common among children and tinea pedis prevalent among adults. Shifts in climate, elevated humidity, and inappropriate antifungal drug use have altered the epidemiology of dermatophytes. Recent reports indicate that *Trichophyton mentagrophytes* has overtaken *T. rubrum* as the dominant species. Moreover, the emergence of *Trichophyton indotineae* isolates, many of which are terbinafine resistant and associated with treatment failures, has been documented. These trends have been linked to uncontrolled use of topical antifungal creams and travel-associated spread (Durdu, 2023; Durdu, 2023; Karakaş, 2009).

The inappropriate and uncontrolled use of antifungal agents is a key driver of this resistance. In clinical settings, empirical or prolonged antifungal therapy without adequate diagnostic confirmation contributes to selective pressure. In the community, over-the-counter availability of topical antifungals and misuse of combination creams containing corticosteroids and antifungals promote the emergence of resistant dermatophyte strains such as *Trichophyton indotineae*. Moreover, the extensive use of azole compounds in agriculture has been linked to the environmental selection of resistant *Aspergillus* strains, which can subsequently infect humans.

In summary, the epidemiology of fungal infections is shaped by host immune status, environmental factors, healthcare practices, and antifungal resistance patterns. The growing global burden underscores the need for strengthened surveillance systems and the adoption of a “One Health” perspective to effectively monitor and manage these infections (Sabino, 2025; Qu, 2025).

### **Health Literacy**

Health literacy (HL) relates to literacy and is the knowledge, motivation, and competencies of people to access, understand, evaluate, and apply health information (Kickbusch, 2008; European Health Policy Forum, 2005). HL is dynamic; it requires the individual to discard outdated information and to continuously learn new information, and it requires a constant interaction between the individual, health professionals, and other community resources (Kickbusch, 2008). An individual’s HL can also change throughout life as skill sets are subjected to different information processing demands. To reflect this, recently a Canadian Expert Panel adopted the following definition for HL: “The ability to access, understand, evaluate, and communicate information as a way of promoting, maintaining, and improving health across the life course in various settings” (Canadian Expert Panel). HL includes four dimensions and three domains. These dimensions are access to health-related information, understanding health-related information, evaluating health-related information,

and applying health-related information. The domains are health care, disease prevention, and health promotion (Sørensen, 2012).

Apart from dimensions and domains, in expressing the stages of HL, Nutbeam proposes that health literacy includes the following:

Basic/functional literacy: sufficient basic reading and writing skills to be able to function effectively in daily situations.

Communicative/interactive literacy: more advanced cognitive and literacy skills, together with social skills, which can be used to actively participate in daily activities, extract information and meaning from different forms of communication, and apply new information to changing circumstances.

Critical literacy: more advanced cognitive skills, together with social skills, which can be used to critically analyze information and to use this information to exert greater control over life events and situations (Nutbeam, 2000).

Although there are major differences among countries, limited health literacy continues to be a public health problem affecting both developed and developing countries. In the 2019 European Health Literacy Survey (HLS19, 2019–2021), limited HL was found to be highest in Germany (72%) and lowest in Slovenia (25%) (HLS19 Consortium, 2021).

According to national surveys conducted by the Ministry of Health in Türkiye, between 2017-2023 the level of sufficient and excellent HL rose from 31.1% to 46.1% (Turkey Health Literacy Level and Related Factors Survey, 2018; Ersözlü, 2025) Despite this increase, the HL level is still not at the desired level. This shows us that individuals cannot reach correct health information, do not understand the information they reach, and cannot adapt it to themselves. The importance of health literacy in terms of health outcomes was also emphasized when the European Commission in 2007 identified the promotion of health literacy as a key action to reduce health inequalities within the EU (Commission of the European Communities, 2007). In response to the importance of health literacy, many countries have included health literacy targets in strategic national policies. In Türkiye, it is also included under the health heading of the Development Plan and in the Ministry of Health Strategic Plan. In addition, in 2025, Türkiye for the first time published the “National Health Literacy Action Plan” (Ünlü, 2025).

The relationship between HL, health outcomes, and the use of health resources has been demonstrated in many studies. The importance of HL in terms of the outcomes of infectious and communicable diseases has been emphasized. The European Centre for Disease Prevention and Control (ECDC) has explained the role that HL can play in relation to infectious diseases (D'Eath, 2012). In these diseases, the social determinants of health show their effect both through living conditions and environment, and by causing low HL. In fungal infections as well, HL is effective within the framework of basic, primary, secondary, tertiary, and quaternary prevention strategies (Kisling, 2025).

In the basic prevention strategy, the lived environment and multisectoral services interact with the HL level of the community in a spiral manner. In the primary prevention strategy, components of HL such as education, knowledge, and awareness affect especially the adequacy of performing general hygiene practices in reducing risk factors. In the secondary prevention strategy, awareness of fungal infections and knowledge of early symptoms, through HL level, affect early diagnosis and treatment. In the tertiary prevention strategy, during the treatment process of affected individuals, HL levels are effective in treatment adherence, correct application, drug resistance, etc. The quaternary prevention strategy is protection from excessive and unnecessary medical intervention, and if the HL level of the community is low, they cannot evaluate this and may force health professionals into excessive medical intervention. In every step of prevention strategies, which are very important for protecting and promoting health, the health literacy of the community/individuals intertwines with fundamental effective factors in a spiral way.

### **Media Literacy**

Media literacy is defined as the ability to access, analyze, evaluate, and create communication across different types of media. It has two key dimensions: first, the capacity to use technology to access media content; and second, the ability not only to understand but also to critically evaluate this content (European Health Policy Forum, 2005). Media literacy emphasizes that nearly everything viewed, read, or heard in the media is, in essence, constructed and therefore not “natural,” highlighting that media content can be altered or manipulated (Ratzan, 2001). Individuals with media literacy skills require certain cognitive abilities to become

critical consumers of media. Such individuals actively select and use media for specific purposes, seek valid and reliable information, and recognize that media messages are produced through deliberate processes and tools. With this awareness, media-literate individuals adopt a questioning and analytical stance (Vaquero, 2025).

Empirical evidence demonstrates that media exposure can significantly influence health behaviors, particularly during periods of uncertainty such as the COVID-19 pandemic. During this time, widespread dissemination of misinformation—often referred to as an “infodemic”—affected public perceptions of disease risk, prevention strategies, and treatment choices. Studies have shown that individuals exposed to misinformation on social media were more likely to adopt unproven or harmful practices, delay seeking professional care, or mistrust evidence-based medical recommendations. In today’s world, where health issues receive increasing attention in the media, the media dimension of health literacy (HL) has become as important as its interpersonal, social, and economic dimensions. As a key facilitator of access to information, the media is one of the most important partners in improving HL. Studies have shown a positive relationship between individuals’ media literacy and their health literacy levels (Quinn, 2025; Levin-Zamir, 2018; Parandeh Afshar, 2022). When used appropriately, media can contribute significantly to the development of HL. If accurate health information is delivered through the right channels and adapted to different literacy levels, both individual and community health literacy can be strengthened. New and social media provide advantages through speed and broad outreach, but these same advantages pose risks for individuals with low HL. Those lacking media literacy skills are more vulnerable to distorted, misleading, or unhealthy health messages, which can result in harmful health behaviors (Carton Erlandsson, 2025).

For individuals with limited media and health literacy, several community health challenges may arise:

1. Health messages simplified for the purpose of attracting attention or marketing may discourage or delay individuals from seeking appropriate healthcare. For instance, an immunocompromised patient with an early-stage fungal skin infection may trivialize the condition after encountering inaccurate media content and thus avoid medical care until complications develop.
2. Individuals with low HL may believe themselves knowledgeable after exposure to misleading information and attempt to spread this misinformation within their social networks, potentially accelerating the transmission of fungal infections.
3. Patients already undergoing treatment may abandon therapy due to misinformation, particularly as fungal infections often require prolonged treatment. A patient influenced by misleading media messages may turn to unproven “alternative” remedies and discontinue effective therapy.
4. Individuals may fail to adapt inaccurate health information to preventive practices such as early diagnosis, infection control, or hygiene measures, thereby reducing the effectiveness of public health interventions.

Misleading media content may also foster inappropriate health behaviors, such as poor nutrition or unsafe hygiene practices, which can further undermine community health outcomes. Strengthening media literacy is therefore not only a tool for improving individual decision-making but also a safeguard against misinformation that can shape collective perceptions of disease. Historical examples illustrate how media narratives can amplify fear and misunderstanding of fungal risks.

#### ***Historical Examples and the Narratives in the Media***

Historical examples further illustrate how media narratives can distort perceptions of fungal risks. The widely publicized “Pharaoh’s curse” following the opening of Tutankhamun’s tomb was later shown to lack scientific evidence, despite strong media claims. Retrospective analyses demonstrated no significant difference in mortality among exposed individuals, suggesting that the narrative was largely constructed through media amplification rather than biological reality.

Media coverage of fungal infections is often driven by dramatic and emotionally charged narratives rather than epidemiological evidence. Events such as mold exposure following natural disasters, high-profile legal cases related to indoor contamination, and individual stories of severe fungal disease have been widely reported in the media. While these cases increase public visibility, they frequently emphasize fear and exceptional outcomes rather than typical disease patterns, contributing to distorted risk perception.

After Hurricane Katrina in the United States in 2005, individuals returning to their homes reported symptoms such as cough, headache, and eye irritation, which were popularized in the media as “Katrina cough.” These cases were attributed to the mycotoxins produced by molds such as *Stachybotrys*, which proliferated extensively in water-damaged homes.

In another case, Melinda Ballard and her family in Texas received millions of dollars in compensation after experiencing severe health problems linked to mold exposure. This event exemplified how the media portrayed fungal infections not only as a biological threat but also as a crisis with legal and economic implications. Such reports contributed to widespread fear within the community and reinforced the perception of mold as an “invisible threat” (Bloom, 2009).

One of the most widely publicized cases in the media was the story of Mark Tatum, who lost a large portion of his face due to mucormycosis (bgdailynews, 2001). The shocking images of his facial disfigurement circulated in newspapers and television programs, transforming a rare medical condition into a compelling human-interest story. In such coverage, the medical aspects of the disease were often overshadowed by emotional narratives, focusing on Tatum’s suffering, resilience, and the psychological impact on his family. This framing generated widespread public attention and sympathy but contributed little to broader awareness of fungal pathogenesis or prevention strategies.

Similarly, the death of an American soldier in Afghanistan from a rare fungal infection following combat-related injuries was reported with sensational headlines (Kronen, 2017). Media outlets emphasized the soldier’s youth, bravery, and the grief expressed by his family members, thereby framing the infection as a tragic twist of fate rather than a predictable clinical complication. The emotional tone of these reports amplified empathy among readers but also risked reinforcing the perception of fungal infections as mysterious, unpredictable, and uncontrollable threats.

These examples highlight how fungal infections often gain visibility in the media not through clinical data or epidemiological evidence, but rather through dramatic personal narratives. While such stories can raise public awareness and mobilize community empathy, they may also perpetuate misconceptions by presenting fungal diseases as exceptional tragedies instead of preventable or manageable health conditions. From a community health perspective, this imbalance underscores the need for media coverage that combines human stories with accurate, accessible health information to foster both awareness and understanding.

### **Popular Culture and Cinema**

Fungal infections have also been frequently portrayed as the “enemy” in cinema and digital culture. Productions such as *The Last of Us* popularized the fictional narrative of *Cordyceps* fungi transforming humans into “zombies.” While far removed from scientific reality, such depictions have stimulated both fear and curiosity about fungi among mass audiences. Similarly, horror films and documentaries have sometimes framed fungal infections as supernatural threats, blurring the boundaries between scientific knowledge and popular imagination (Rodríguez Stewart, 2023). This dramatization contributes to shaping public perceptions, reinforcing the mysterious and frightening aspects of fungi, while often neglecting the real clinical and public health dimensions of fungal diseases.

*Candida* species are opportunistic yeasts that are normally present in low abundance within the gastrointestinal tract of healthy individuals. Under normal circumstances, they constitute less than 1% of the gut microbiota and generally maintain a balanced relationship with the host (Perez, 2021). Media representations of *Candida* frequently exaggerate its clinical significance, portraying it as a universal cause of diverse, non-specific symptoms. However, *Candida* species are normal components of the human microbiota, and minor variations in colonization do not necessarily indicate disease. The increasing use of highly sensitive diagnostic tools has further amplified this misconception, often leading to overdiagnosis and unnecessary antifungal use. Such practices not only lack clinical justification but also contribute to antifungal resistance.

### **The Role and Responsibilities of Institutions**

The frequent misinformation about fungal infections in the media is linked not only to individual choices but also to institutional shortcomings. At this point, scientific societies, universities, and health authorities bear significant responsibilities. First, professional societies should develop platforms that enable their members to share expertise with the public, preparing guidelines, brochures, and media statements to disseminate accurate information. International organizations such as the Infectious Diseases Society of America (IDSA), the European Society of Clinical Microbiology and Infectious Diseases (ESCMID), the International Society for Human and Animal Mycology (ISHAM), dermatology societies, and public health associations should take the

lead in providing reliable knowledge to the community regarding both superficial and invasive fungal infections. These organizations could also establish “scientific response mechanisms” to regularly monitor media content and correct misinformation.

In addition, international public health authorities such as the World Health Organization (WHO) and the U.S. Centers for Disease Control and Prevention (CDC) play a crucial role in shaping public awareness. Both institutions provide openly accessible, evidence-based resources on fungal infections through dedicated web platforms, fact sheets, and social media campaigns. WHO emphasizes fungal infections within its “priority pathogens list” and issues global alerts to raise awareness among health professionals and the general public. Similarly, the CDC maintains extensive public-facing materials, including prevention guidelines, patient-friendly FAQs, and outbreak updates, to ensure that accurate and comprehensible information reaches diverse audiences. These initiatives demonstrate how transparent communication by leading health authorities can counteract misinformation and support health literacy at the community level. Global initiatives offer valuable examples. The Global Action for Fungal Infections (GAFFI), for instance, is a non-governmental organization aiming to reduce deaths from fungal infections worldwide (<https://gaffi.org/>). GAFFI conducts international campaigns to raise awareness, alert health authorities, and improve access to early diagnosis and treatment. This model can serve as a guide for other scientific societies and universities across the globe.

In addition to international organizations, national-level institutions also play a vital role. National microbiology, infectious disease, dermatology, and public health societies, together with ministries of health, should actively engage in combating misinformation. These bodies can provide locally relevant educational campaigns, establish public information platforms, and collaborate with universities to strengthen community health literacy. For example, national medical associations and public health institutes are uniquely positioned to develop culturally and linguistically tailored resources, ensuring that accurate information reaches diverse populations. Universities, within their public health mandate, should reach beyond academic publications to provide open access educational materials, short informational videos, and visual content for the wider public. Furthermore, collaborations between faculties of medicine, pharmacy, public health, and communication could be used to design training programs on “health journalism.” Public-facing platforms are among the most powerful tools for accessible and reliable knowledge transfer. Through partnerships between ministries of health, scientific societies, and universities, online information portals such as a “Fungal Infections Knowledge Platform” could be developed to answer frequently asked questions and provide rapid corrections to misinformation.

Ultimately, institutional silence can be as damaging as individual misconceptions, allowing false perceptions to persist. Joint initiatives involving microbiology, infectious disease, dermatology, and public health societies, working together with universities and official health authorities, have the potential to strengthen health literacy and counterbalance the negative influence of misleading media coverage.

## Discussion

Fungal infections, health literacy, and media literacy are deeply interconnected determinants of community health outcomes. Addressing fungal diseases effectively requires moving beyond a purely biomedical perspective toward an integrated framework that incorporates informational and societal dimensions. Health literacy enables individuals to understand and act upon medical information, while media literacy equips them to critically evaluate the rapidly expanding volume of health-related content. In the absence of these competencies, individuals may misinterpret symptoms, delay care, adopt ineffective or harmful treatments, or contribute to the spread of misinformation.

This review underscores that improving outcomes in fungal infections is not only a matter of clinical management but also of strengthening the informational environment in which health decisions are made. Public health strategies should therefore integrate health and media literacy interventions alongside traditional infection control and treatment approaches.

Collaborative efforts among healthcare professionals, academic institutions, public health authorities, and media organizations are essential to ensure that accurate and evidence-based information reaches diverse populations. Developing structured communication strategies, monitoring misinformation, and promoting accessible educational content should be considered core components of fungal infection control programs.

Ultimately, enhancing both health literacy and media literacy represents a sustainable and scalable approach to reducing the burden of fungal diseases, improving patient outcomes, and fostering more resilient and informed communities.

## Conclusion and Recommendations

Health literacy plays a critical role in maintaining health, preventing disease, guiding treatment processes, and promoting overall well-being. Media literacy, as a supporting parameter, reinforces this process. Together, health and media literacy interact to shape health outcomes at both the individual and community level. Advancing in this area requires the active involvement of multiple stakeholders. The media has an essential responsibility to present health information in ways that are tailored to the health and media literacy levels of individuals and communities. Journalists, editors, and content creators should be aware of this responsibility and themselves demonstrate a high level of health literacy. At the same time, media platforms including social media and the internet must be monitored to minimize the spread of misinformation. Health professionals also need adequate training and awareness so that they can adapt their communication strategies to the health literacy levels of patients and families. Educational initiatives targeting both individuals and communities are therefore indispensable to strengthen resilience against misinformation and to empower populations to make informed health decisions. Ultimately, improving health and media literacy is not solely an individual responsibility but a community-wide effort. Collaboration between health authorities, professional societies, educational institutions, and media organizations is essential to ensure that accurate, accessible, and culturally appropriate information reaches the public. By reinforcing health literacy at the community level, societies can better protect themselves against fungal infections and other health threats while promoting more equitable health outcomes.

### Declarations:

Funding: No funding

Conflict of interest: The author declares that they have no conflicts of interest.

Ethics approval: Not relevant

Consent to participate: Not relevant

Consent for publication: No need

Availability of data and material: No data

Code availability: No software application or custom code

## References

1. Ağalar, C., Erdem, H., Çağ, Y., Arda, B., Balık, R., Baştuğ, A., Dalyan Cilo, B., Erben, N., Eryılmaz Eren, E., Iskender, G., Kalkancı, A., Karabiçak, N., Koçak Tufan, Z., Parlak, E., Didem Sari, N., Sayin, M., Şenbayrak, S., Tekin, R., Ulu Kiliç, A., Utku, T., Uzun, Ö., Yapar Toros, G., Arıkan Akdağlı, S. (2025). Consensus paper on *Candida auris* by Türkiye EKMUD, ID-IRI, THSK of Ministry of Health of the Republic of Türkiye, KLİMUD, TMC, TARD, and TYBD. *Turkish Journal of Medical Science*, 55 (4): 1039-1062. doi: 10.55730/1300-0144.6059.
2. Bays, D.J., Savage, H.P. (2025). *Candida albicans* gastrointestinal colonization resistance: a host-microbiome balancing act. *Infection and Immunity*, 93, (9): e0061024. doi: 10.1128/iai.00610-24.
3. Bloom, E., Grimsley, L.F., Pehrson, C., Lewis, J., Larsson, L. (2009). Molds and mycotoxins in dust from water-damaged homes in New Orleans after hurricane Katrina. *Indoor Air*, 19, (2): 153-8. doi: 10.1111/j.1600-0668.2008.00574.x.
4. Carton Erlandsson, L., Bocchino, A., Palazón-Fernandez, J.L., Lepiani, I., Chamorro Rebollo, E., Quintana Alonso, R. (2025). Validation of the adapted eHEALS questionnaire for assessing digital health literacy in social media: A pilot study. *Nursing Reports*, 15, (9): 330. doi: 10.3390/nursrep15090330.
5. Chamorro, M., House, S.A., George, B. (2025). Fungal infections. *Primary Care*, 52 (3): 487-498. doi: 10.1016/j.pop.2025.05.002.
6. Commission of the European Communities. (2007). Together for Health: A Strategic Approach for the EU 2008-2013. Retrieved September 24, 2025, from
7. [https://ec.europa.eu/health/ph\\_overview/Documents/strategy\\_wp\\_en.pdf](https://ec.europa.eu/health/ph_overview/Documents/strategy_wp_en.pdf)
8. European Health Policy Forum. *Recommendations on Health Information*. Brussels, May 2005. Available from:
9. [https://ec.europa.eu/health/ph\\_overview/health\\_forum/docs/Recom\\_health\\_information.pdf](https://ec.europa.eu/health/ph_overview/health_forum/docs/Recom_health_information.pdf) [Accessed 5 October 2025].
10. D'Eath, M., Barry, M. M., Sixsmith, J. (2012). Rapid evidence review of interventions for improving health literacy. Stockholm: European Centre for Disease Prevention and Control. Retrieved from <https://www.ecdc.europa.eu/en/publications-data/rapid-evidence-review-interventions-improving-health-literacy>
11. Durdu, M., Kandemir, H., Karakoyun, A.S., Ilkit, M., Tang, C., de Hoog, S. (2023). First terbinafine-resistant *Trichophyton indotineae* isolates with Phe397Leu and/or Thr414His mutations in Turkey. *Mycopathologia*, 188 (1): 2. doi: 10.1007/s11046-023-00708-2.
12. Durdu, M., Ilkit, M. (2023). Strategies to improve the diagnosis and clinical treatment of dermatophyte infections. *Expert Review of Anti-Infective Therapy*, 21 (1): 29-40. doi: 10.1080/14787210.2023.2144232.
13. El-Tawil, S., & El-Tawil, T. (2003). Lord Carnarvon's death: the curse of aspergillosis?. *Lancet (London, England)*, 362, (9386), 836. [https://doi.org/10.1016/s0140-6736\(03\)14268-7](https://doi.org/10.1016/s0140-6736(03)14268-7)
14. Ener, B., Ergin, Ç., Gülmez, D., Ağca, H., Tikveşli, M., Aksoy, S.A., Otkun, M., Siğ, A.K., Ögünç, D., Özhak, B., Topaç, T., Özdemir, A., Metin, D.Y., Polat, S.H., Öz, Y., Koç, N., Atalay, M.A., Erturan, Z., Birinci, A., Çerikçioğlu, N., Timur, D., Ekşi, F., Genç, G.E., Findik, D., Gürcan, Ş., Kalkancı, A., Arıkan-Akdaglı, S. (2022). Frequency of azole resistance in clinical and environmental strains of *Aspergillus fumigatus* in Turkey: a multicentre study. *Journal of Antimicrobial Chemotherapy*, 77 (7): 1894-1898. doi: 10.1093/jac/dkac125.
15. Ersözlü, M., Akıncı Aydınli, E., Selçuk, E., Şen, E. (2025). Patients with chronic obstructive pulmonary disease and the use of complementary and alternative medicine: The role of health literacy in Türkiye. *Chronic Respiratory Disease*, 22, 14799731251382230. <https://doi.org/10.1177/14799731251382230>
16. Gupta, A.K., Thornbush, M., Wang, T. (2025). Climate change, natural disasters, and cutaneous fungal infections. *International Journal of Dermatology*, 64 (8): 1349-1355. doi: 10.1111/ijd.17908.
17. The HLS19 Consortium of the WHO Action Network. (2021). International Report on the Methodology, Results, and Recommendations of the European Health Literacy Population Survey 2019-2021 (HLS19) of M-POHL. Austrian National Public Health Institute. [Retrieved October 5, 2025]
18. <https://bgdailynews.com/2001/02/05/fungus-steals-part-of-face-but-not-determinati,on-2/> [Accessed October 5, 2025]
19. [https://www.cpha.ca/sites/default/files/uploads/resources/healthlit/report\\_e.pdf](https://www.cpha.ca/sites/default/files/uploads/resources/healthlit/report_e.pdf) [Accessed 5 October 2025].
20. <https://www.who.int/publications/i/item/9789240060241> [Accessed 5 October 2025].
21. Karakaş, M., Turaç-Biçer, A., Ilkit, M., Durdu, M., Seydaoğlu, G. (2009). Epidemiology of pityriasis versicolor in Adana, Turkey. *Journal of Dermatology*, 36 (7): 377-82. doi: 10.1111/j.1346-8138.2009.00663.x.
22. Kickbusch, I., Wait, S., Maag, D. Navigating health: The role of health literacy: Healthy Choices Forum; 2008. (<https://ilcuk.org.uk/navigating-health-the-role-of-health-literacy/>) [Accessed 5 October 2025].
23. Kisling, L.A., Das, J.D. (2025) *Prevention Strategies*, Treasure Island (FL): StatPearls Publishing; 2025 Jan). [Retrieved October 5, 2025]

24. Kronen, R., Liang, S.Y., Bochicchio, G., Bochicchio, K., Powderly, W.G., Spec, A. (2017). Invasive fungal infections secondary to traumatic injury. *International Journal of Infectious Disease*, 62, 102-111. doi: 10.1016/j.ijid.2017.07.002.
25. Levin-Zamir D, Bertschi I (2018). Media Health Literacy, eHealth Literacy, and the Role of the Social Environment in Context. *International Journal of Environmental Research and Public Health*, 15, (8):1643. doi: 10.3390/ijerph15081643.
26. Moore, J.E., Tang, K.W.K., Millar, B.C. (2023). Improving health literacy of antifungal use-comparison of the readability of antifungal medicines information from Australia, EU, UK, and US of 16 antifungal agents across 5 classes (allylamines, azoles, echinocandins, polyenes, and others). *Medical Mycology*, 61 (9): myad084. doi: 10.1093/mmy/myad084.
27. Narayanan, A., Ambily, Shaji. A., Pullepu, D., Bhattacharya, J., Sanyal, K. (2025). Pathogenic features, experimental models, and molecular tools of human fungal pathogens: Who's on WHO's Radar? *ACS Infectious Disease*, 11 (7): 1816-1843. doi: 10.1021/acsinfecdis.5c00081.
28. Nelson, M.R. (2002). The mummy's curse: historical cohort study. *British Medical Journal*, 325 (7378): 1482-4. doi: 10.1136/bmj.325.7378.1482.
29. Nutbeam, D. (2000). Health literacy as a public health goal: a challenge for contemporary health and education and communication strategies into the 21st century. *Health Promotion International*, 15 (3): 259-67.
30. Pagano, L., Fernández, O.M. (2025). Clinical aspects and recent advances in fungal diseases impacting human health. *Journal of Antimicrobial Chemotherapy*, 80 (Supplement\_1): i2-i8. doi: 10.1093/jac/dkaf004.
31. Popova, M., Rogacheva, Y. (2025). Epidemiology of invasive fungal diseases in patients with hematological malignancies and haematopoietic cell transplantation recipients: Systematic review and meta-analysis of trends over time. *Journal Infectious Public Health*, 18 (8): 102804. doi: 10.1016/j.jiph.2025.102804.
32. Qu, J., Liang, M., Luo, Y. (2025). Rapid increase in the incidence of human invasive fungal diseases based on One Health Perspective. *Mycoses*, 68 (8): e70098. doi: 10.1111/myc.70098.
33. Quattrone, M., Di Pilla, A., Brunetti, S., Giordano, A., Fianchi, L, Pagano, L., Criscuolo, M. (2025). Managing invasive fungal infections during allogeneic hematopoietic transplantation: A 2025 update. *Mediterranean Journal of Hematology and Infectious Diseases*, 17 (1): e2025064. doi: 10.4084/MJHID.2025.064.
34. Quinn, B., Nichols, L., Frazee, J., Payton, M., Linger, R. M. A. (2025). Dissemination of Information on Selective Serotonin Reuptake Inhibitors on TikTok: Analytical Mixed Methods Study of Creator Types, Content Tone, and User Engagement. *JMIR Mental Health*, 12, e77383. <https://doi.org/10.2196/77383>
35. Parandeh Afshar, P., Keshavarz, F., Salehi, M., Fakhri Moghadam, R., Khajoui, E., Nazari, F., & Dehghan, M. (2022). Health Literacy and Media Literacy: Is There Any Relation?. *Community Health Equity Research & Policy*, 42 (2), 195–201. <https://doi.org/10.1177/0272684X20972642>
36. Pérez, J.C. (2021). The interplay between gut bacteria and the yeast *Candida albicans*. *Gut Microbes*, 13, (1): 1979877. doi: 10.1080/19490976.2021.1979877.
37. Ratzan, S. C. (2001). Health literacy: Communication for the public good. *Health Promotion International*, 16 (2), 207-214. <https://doi.org/10.1093/heapro/16.2.207>
38. Republic of Türkiye, Ministry of Health, General Directorate of Health Promotion. (2018). Turkey Health Literacy Level and Related Factors Survey 2018 [in Turkish]. Ankara: Ministry of Health. Available from: <https://dosyamerkez.saglik.gov.tr/Eklenti/50280/0/turkiye-saglik-okuryazarligi-ve-iliskili-faktorleri-arastirmasipdf.pdf> [Accessed 5 October 2025].
39. Rodríguez Stewart, R.M., Gold, J.A.W., Chiller, T., Sexton, D.J., Lockhart, S.R. (2023). Will invasive fungal infections be The Last of Us? The importance of surveillance, public-health interventions, and antifungal stewardship. *Expert Review of Anti-Infective Therapy*, 21 (8): 787-790. doi: 10.1080/14787210.2023.2227790.
40. Sabino, R., Antunes, F., Araujo, R., Bezerra, A.R., Brandão, J., Carneiro, C., Carvalho, A., Carvalho, D., Conceição, I.C., Cota Medeiros, F., Cruz, C., Duarte, E., Holum, S., Matos, O., Maltez, F., Mendonça, A., Moura, G., Pereira, A., Fortuna Rodrigues, C., Teixeira, P., Valdoleiros, S.R., Veríssimo, C., Viegas, C.; Portuguese Association of Medical Mycology (ASPOMM) (2025). Addressing Critical Fungal Pathogens Under a One Health Perspective: Key Insights from the Portuguese Association of Medical Mycology. *Mycopathologia*, 190 (5): 73. doi: 10.1007/s11046-025-00981-3.
41. Sørensen, K., Van den Broucke, S., Fullam, J., Doyle, G., Pelikan, J., Slonska, Z., Brand, H; (HLS-EU) Consortium Health Literacy Project European. (2012). Health literacy and public health: a systematic review and integration of definitions and models. *BMC Public Health*, 12: 80. doi: 10.1186/1471-2458-12-80.
42. Swain, S., Ajayababu, A., Chowdhury, S., Singh, G., Ray, A. (2025). Epidemiology of triazole resistant *Aspergillus fumigatus* in Asia: A systematic review and meta-analysis. *Mycoses*, 68 (8): e70099. doi: 10.1111/myc.70099.

43. Ünlü, G., Altındağ, S. (2025). The cross-sectional association of health literacy with healthy lifestyle behaviors in the Turkish population: A systematic review and meta-analysis. *The American Journal of Health Promotion (AJHP)*, 39 (3), 520-536. <https://doi.org/10.1177/08901171241300190>
44. Vaquero, L., Groves, K., Muñoz-Vidal, E. L., James, K., Marlor, J. L., McIntyre, C., Ostia, L., Sirota, S., Shields, L., Degé, F., García-Mingo, E., Ripollés, P. (2025). Studying the effects of digital arts-based interventions on teenagers' social media usage, brain connectivity, and mental health: study protocol of the SMART project. *European Journal of Psychotraumatology*, 16 (1), 2550079. <https://doi.org/10.1080/20008066.2025.2550079>